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ENVIRONMENTAL IMPACT REPORT
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GOLDEN GATE HEIGHTS
RESIDENTIAL DEVELOPMENT

ASSESSORS BLOCKS 1928,
1928B, 1860B AND 1929A

WAII-SAN FRANCISCO INVESTMENT COMPANY
lliam Ghidossi, Contact

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2. City and County of San Francisco-U.S. Environmental Protection Agency; Environmental Impact Report and Statement, San Francisco Wastewater Master Plan, 1974

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SUMMARY

A residential development of three and four bedroom homes is proposed for construction in the Golden Gate Heights section of San Francisco.

The project sponsor, Hawaii-San Francisco Investment company, seeks to construct the 83 residences for resale to families expected to occupy them. The homes are expected to sell for up to $105,000.

Certain adverse effects both long and short term can be anticipated should the project be permitted among which are those normally associated with construction, such as noise and local air pollution. Over the long term, the proposed project with it's anticipated local population increase is expected to exert increased pressures on local trafficways and the area service delivery network.

The developer proposes mitigation measures designed to reduce the anticipated adverse impacts of the proposed development to an acceptable level.

CHAPTER I

PROJECT DESCRIPTION

The proposed project involves the construction of an owner occupied residential housing development consisting of 83 three and four bedroom homes, on approximately 10 acres of previously undeveloped land in San Francisco's Golden Gate Heights district (see Figures 1 & 2). These single family homes are expected to sell for prices ranging from $82,500 to $105,00.

Purpose of Project

The project sponsor seeks to realize a profit on his investment in the land by developing the area for its best economic use consistant with existing land use regulations.

Site Location

The four parcels of land to be used for this proposed development are located in Assessor's Blocks 1860B, 1928, 1928B, and 1929A within the City and County of San Francisco. These particular blocks are hilly and of irregular shape (see Figure 2). Individual lots within these blocks average 30 X 100 feet yeilding gross square footages of 3000 square feet. Some lots are of odd size owing to the irregular shape of the blocks however, none are less than the 2640 square foot area minimum provided for by Sections 124 and 127 of the City's Planning Code.

The entire proposed development area is zoned R-1 (single family-low density), as is most of the area immediately adjacent to it.

Building height limits of the proposed site, as provided for by Section 121 of the Planning Code, are 40 feet.

Types of Buildings

The proposed project would consist of wooden frame buildings supported by either concrete piers cast in place, or concrete slabs placed on-grade. Eight 3 and 4 bedroom configurations are proposed which are designed to conform to existing landforms and the neighborhood architectural character. Each of the proposed homes is to be constructed over a two-car garage.

PROPOSED DEVELOPMENT LOCATIONS

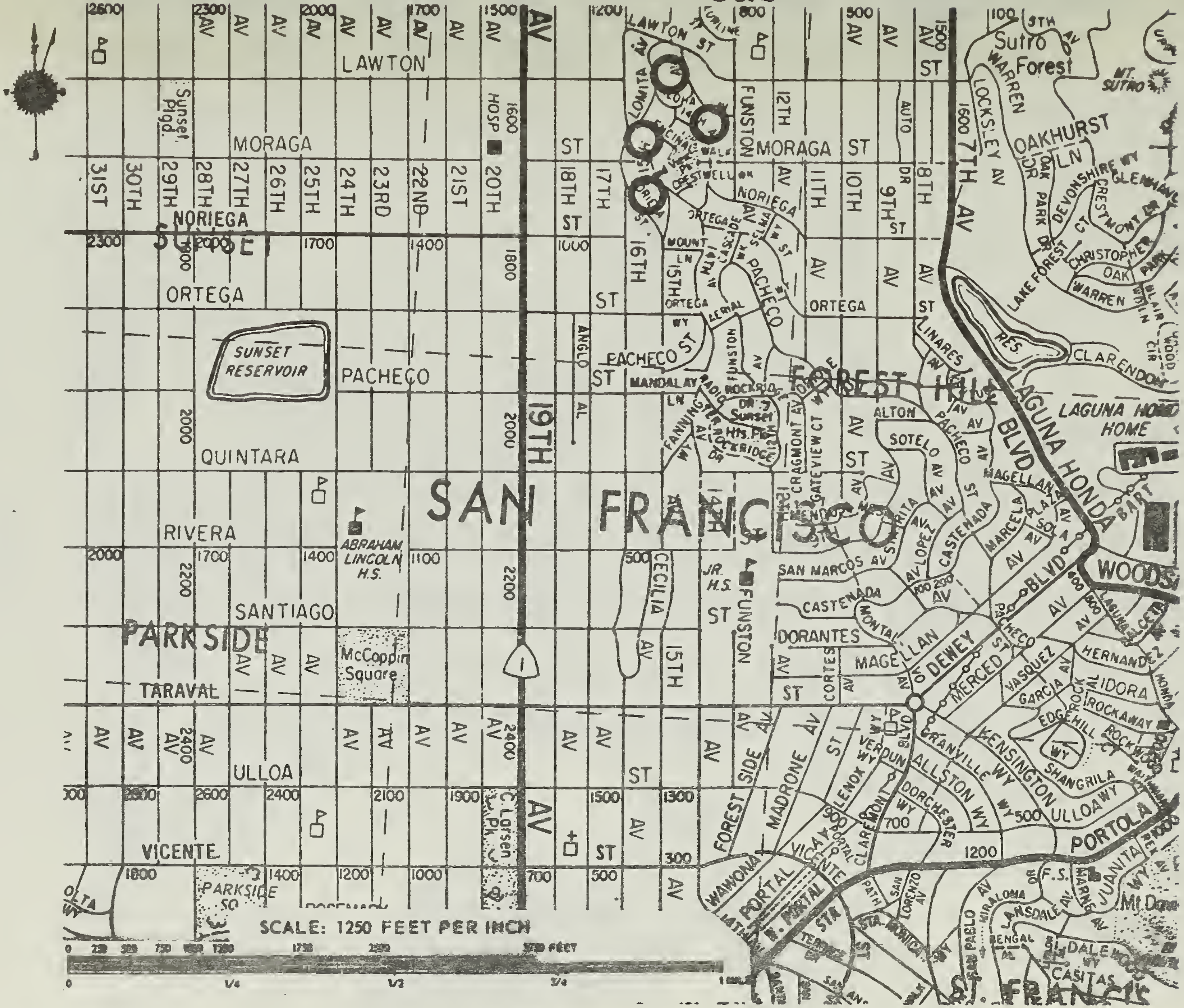


FIGURE 1

VICINITY MAP

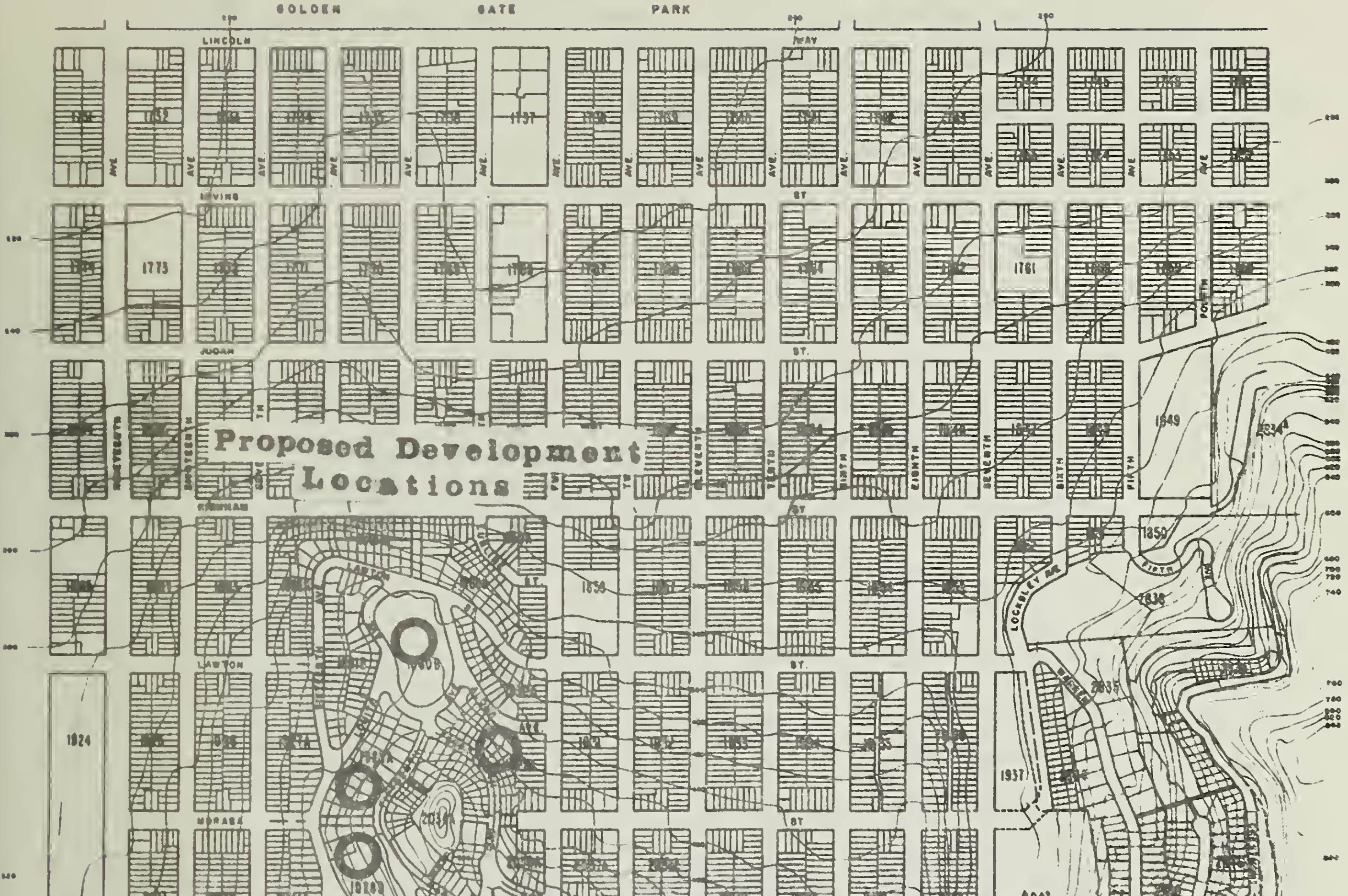


FIGURE 2

TOPOGRAPHICAL MAP

Pertinent features of these individual configurations are summarized in Table 1. Artists renditions of the configurations are displayed in Figures 3 through 11 and their proposed locations within the development are illustrated by Figures 12 through 15.

TABLE I
GOLDEN GATE HEIGHTS
PROJECT CONFIGURATION
SUMMARY

CONFIGURATION	NUMBER PROPOSED	FLOOR SPACE*	STORIES	BEDROOMS	DESIGN POPULATION MAXIMUMS	PROJECTED POPULATION
A	12	2100	3	4	6	72
B	17	2015	2	3	5	85
C	8	2050	1	3	5	40
D	16	2070	2	3	5	80
E	6	2400	2	4	6	36
F	11	2040	3	3	5	55
G	6	3070	2	3	5	30
H	7	3104	2	4	6	42
						440 Total**

*Floor space statistics quoted in square feet

** Population totals are an arithmetic function of people X bedrooms only and represent maximums rather than expected totals.

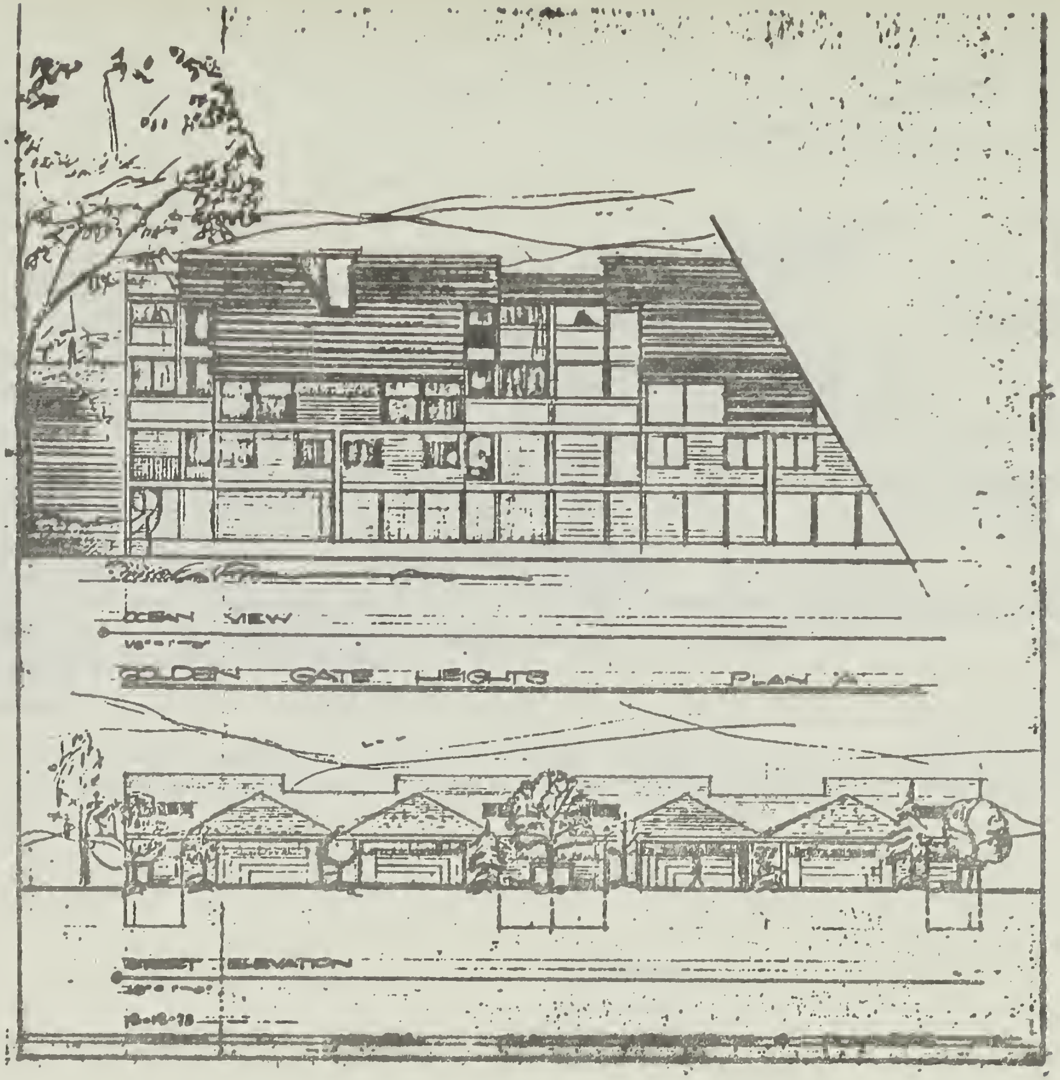


FIGURE 3

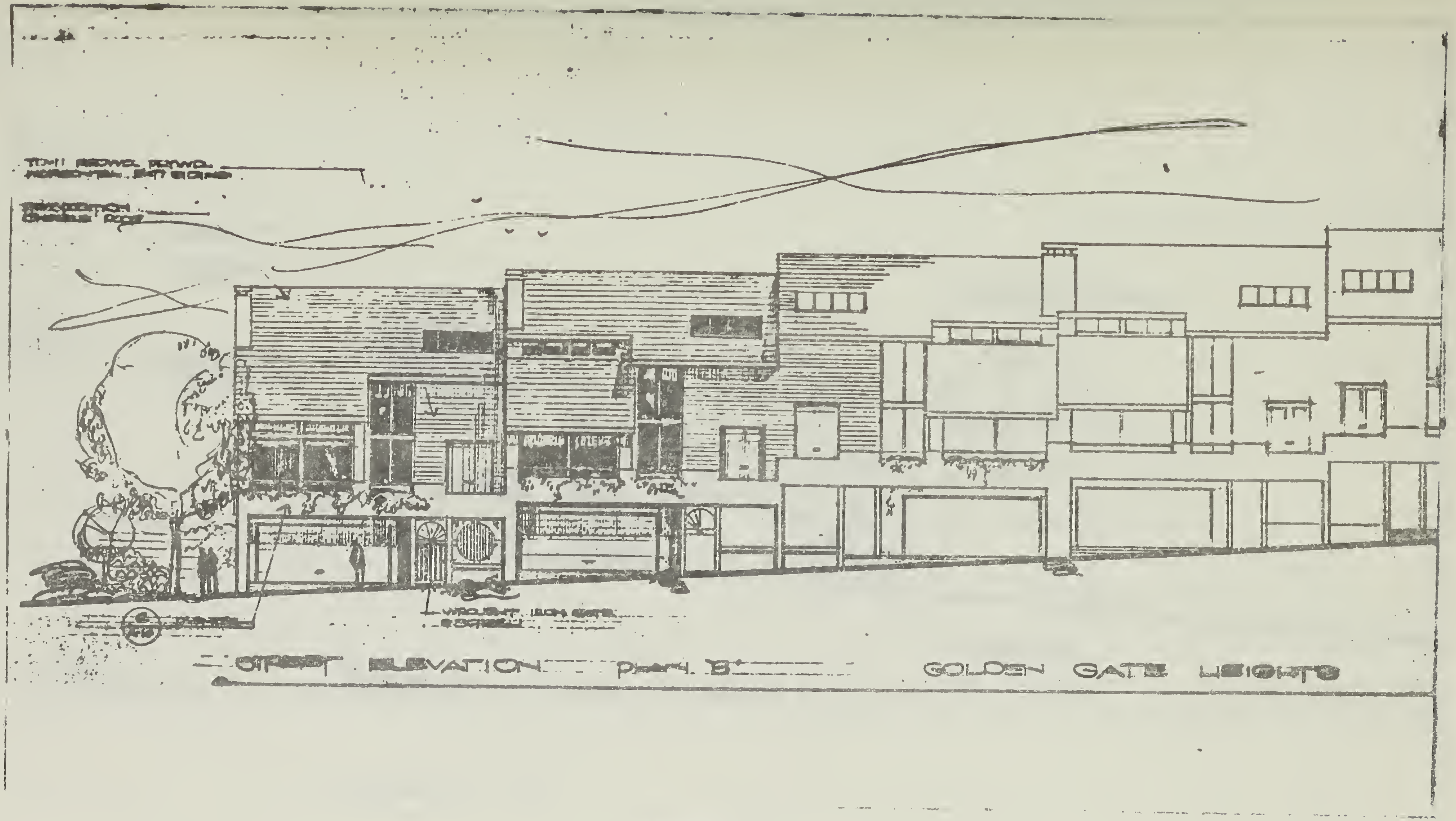
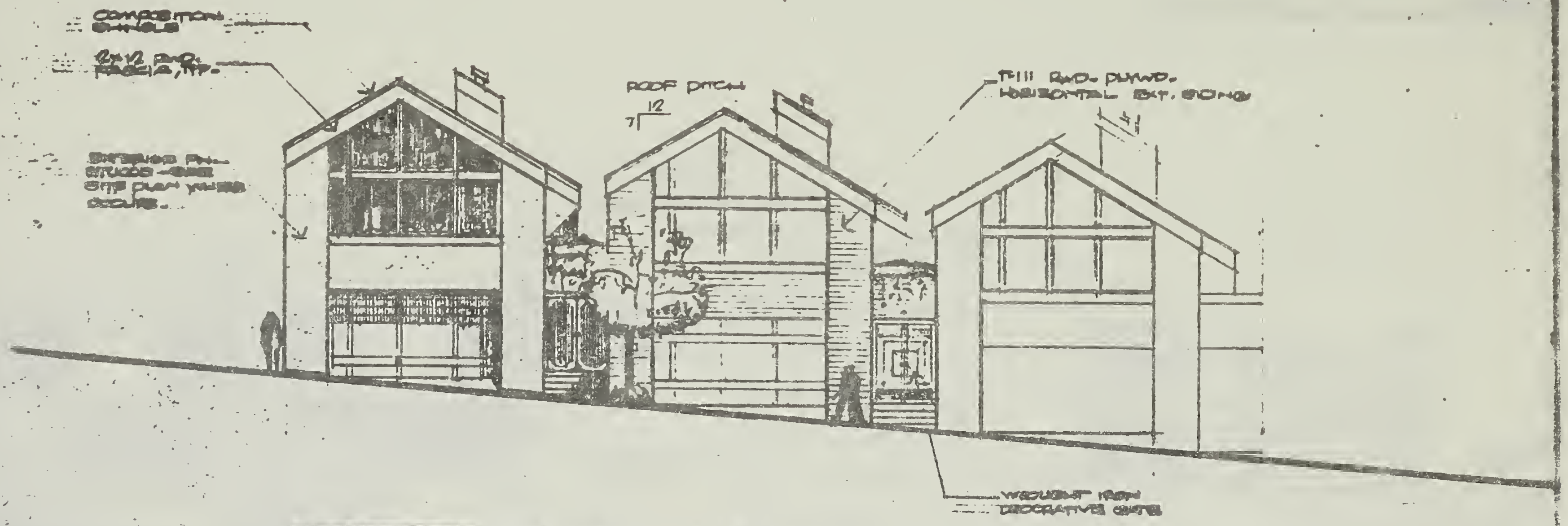

WROUGHT IRON GATE
STREET ELEVATION
PHASE 'B'
GOLDEN GATE HEIGHTS

FIGURE 4


COMPOSITION SHINGLE
2x12 RGH. FASCIA, TYP.
EXTERIOR FIN. STUCCO—SEE SITE PLAN WHERE OCCURS.
ROOF PITCH
7 12
T-111 RGH. PLYWD. HORIZONTAL EXT. SIDING
WROUGHT IRON DECORATIVE GATE

STREET ELEVATION

PLAN 'C'

FIGURE 5

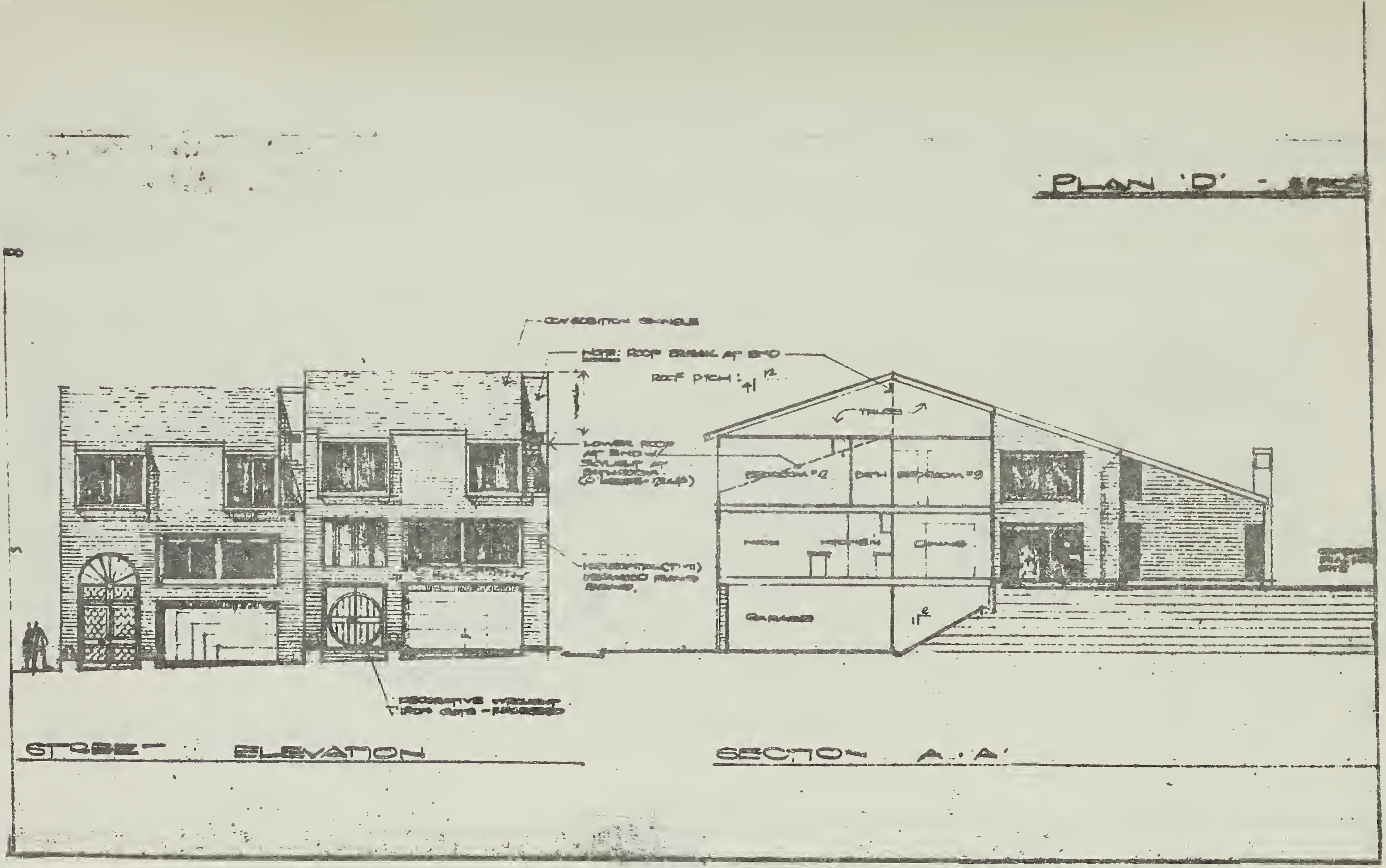

PLAN 'D' -
COMPOSITION SHINGLE
NOTE: ROOF BREAK AT END
ROOF PITCH: 4/12
LOWER ROOF AT END w/ SKYLIGHT AT BATHROOM
HORIZONTAL (T-11) REDWOOD PANEL SIDING.
DECORATIVE WROUGHT IRON GATE - RECESSED
TRUSS
BEDROOM #2
BATH
BEDROOM #3
KITCHEN
DINING
GARAGE
STREET ELEVATION
SECTION A-A'

FIGURE 6

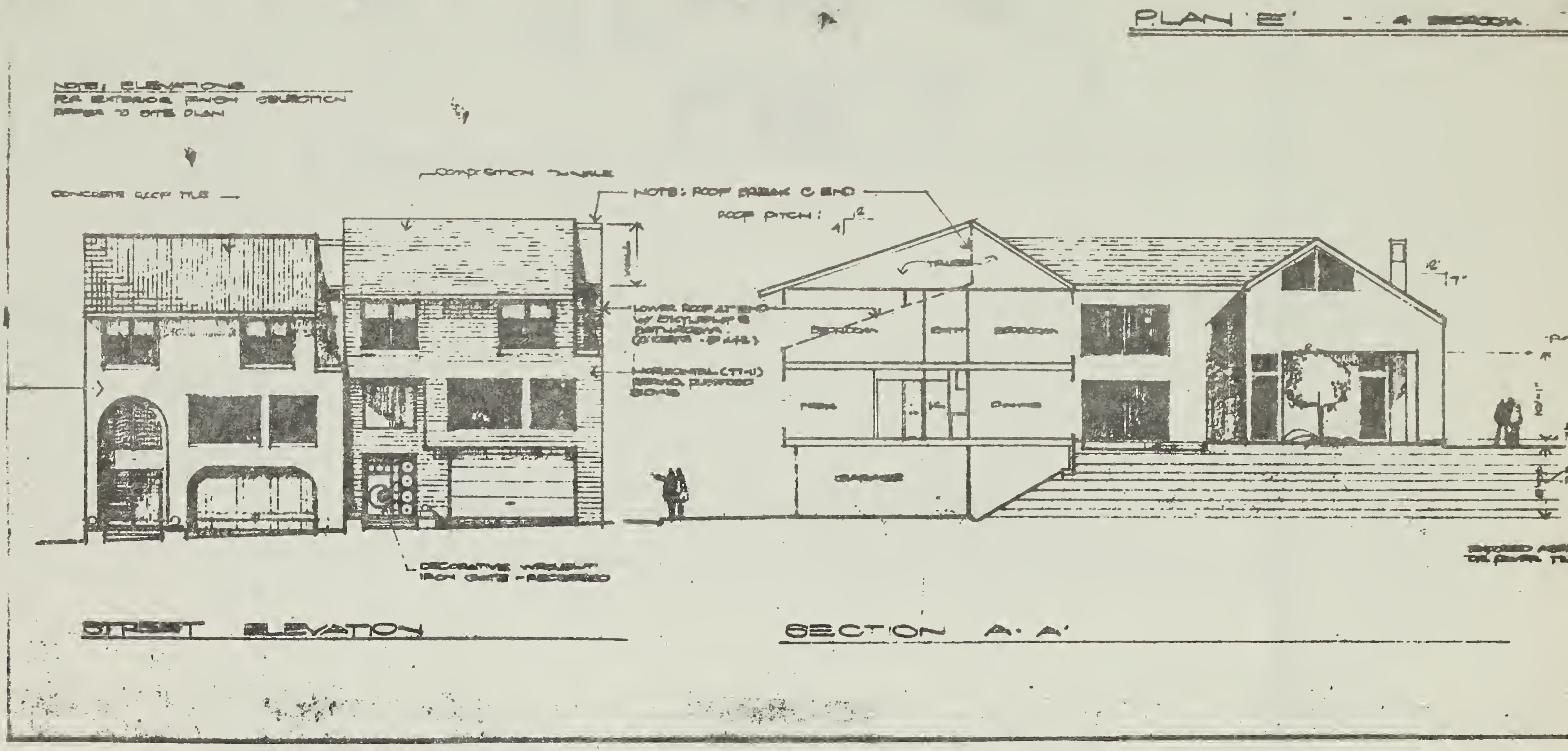

PLAN 'E' - 4 BEDROOM
NOTE: ELEVATIONS
FOR EXTERIOR FINISH SELECTION
REFER TO SITE PLAN
CONCRETE ROOF TILE
COMPOSITION SHINGLE
NOTE: ROOF BREAK @ END
ROOF PITCH: 4/12
LOWER ROOF AT END
W/ SKYLIGHT @
BATHROOM
HORIZONTAL (T1-11)
GROOVED PLYWOOD
SIDING
DECORATIVE WROUGHT
IRON GATE - REQUIRED
TRUSS
BEDROOM
BATH
BEDROOM
FAMILY
K
DINING
GARAGE
STREET ELEVATION
SECTION A-A'

FIGURE 7

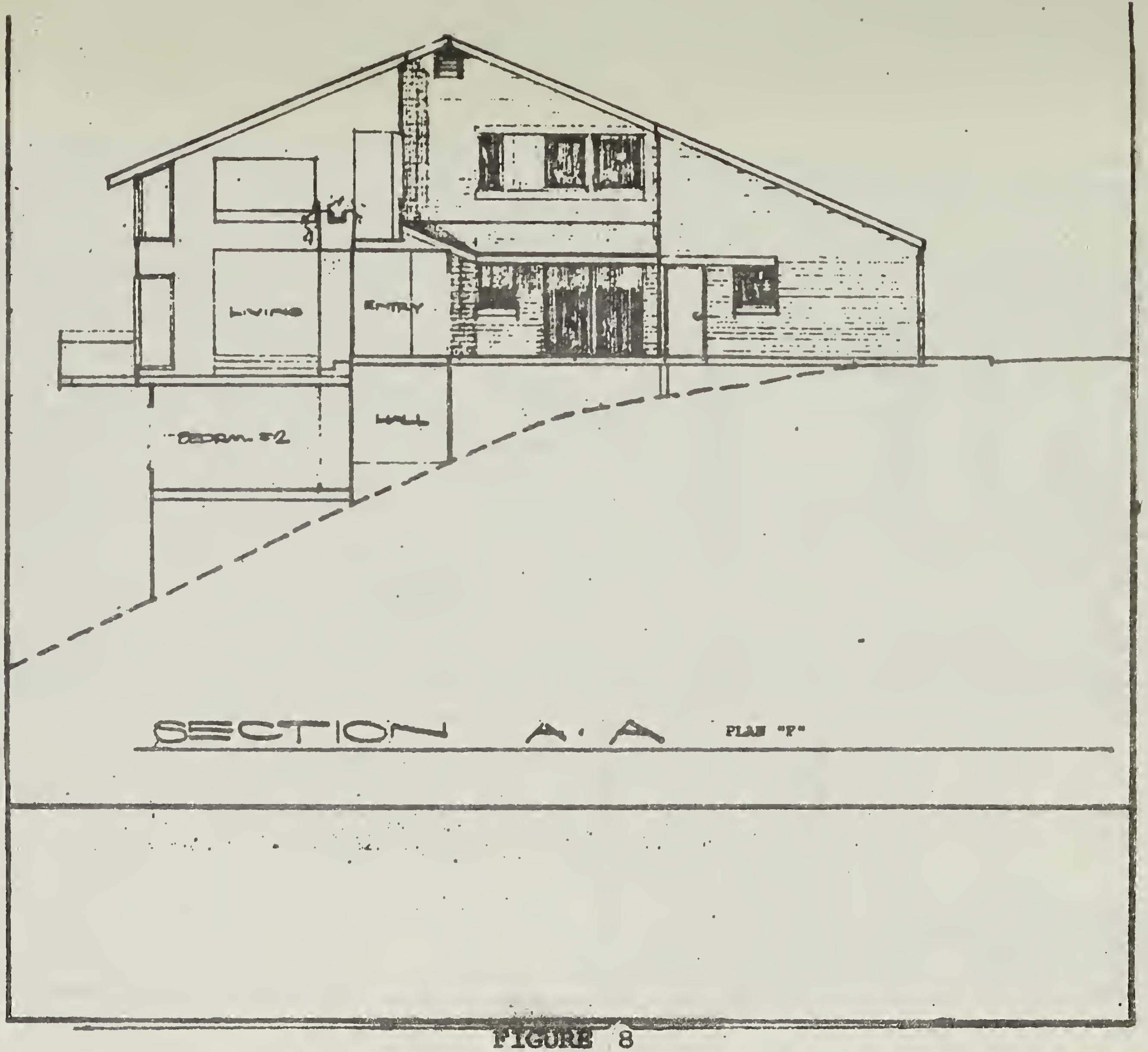
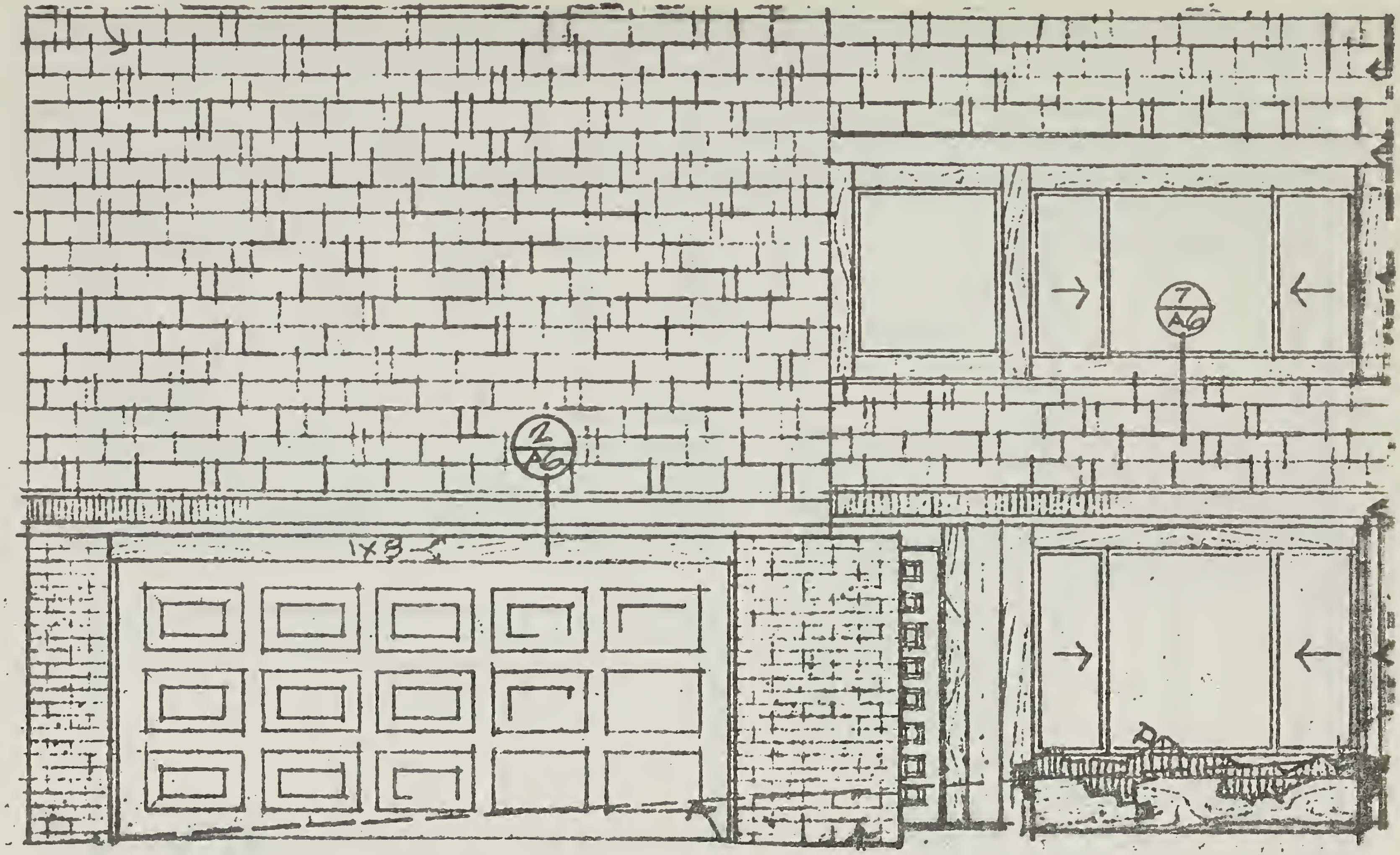


FIGURE 8



Plan G

FIGURE 9

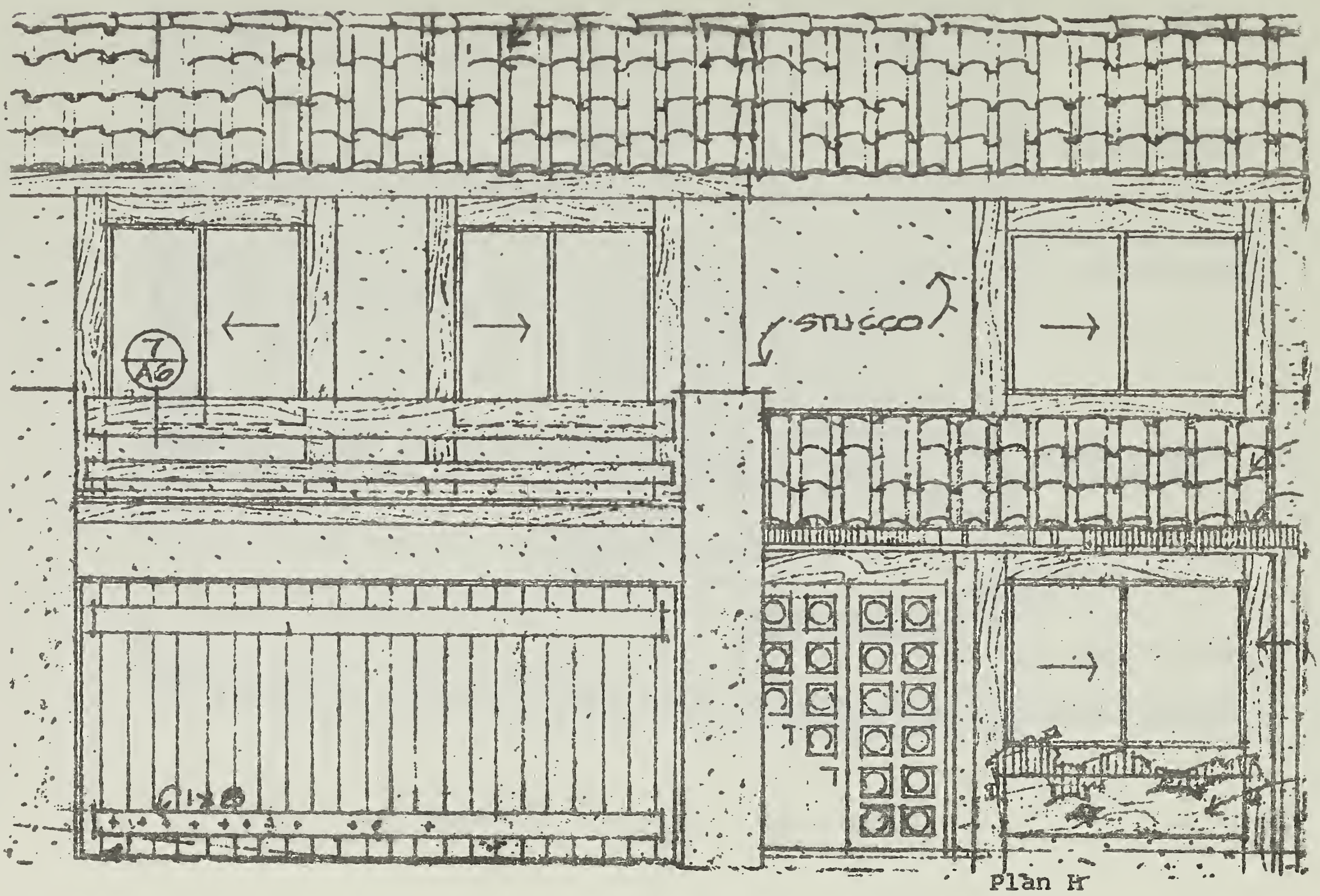


FIGURE 10

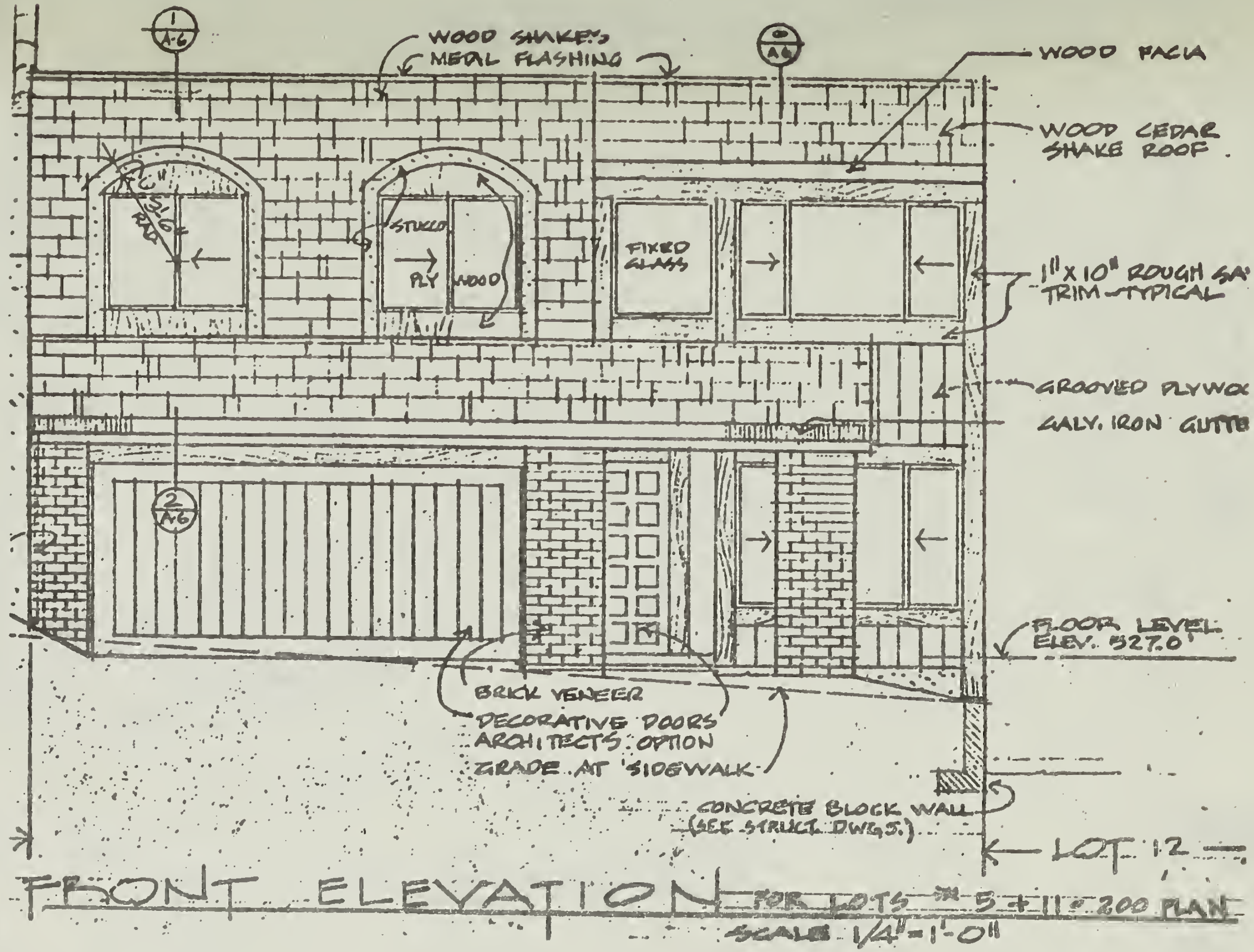


FIGURE 11 Plan H

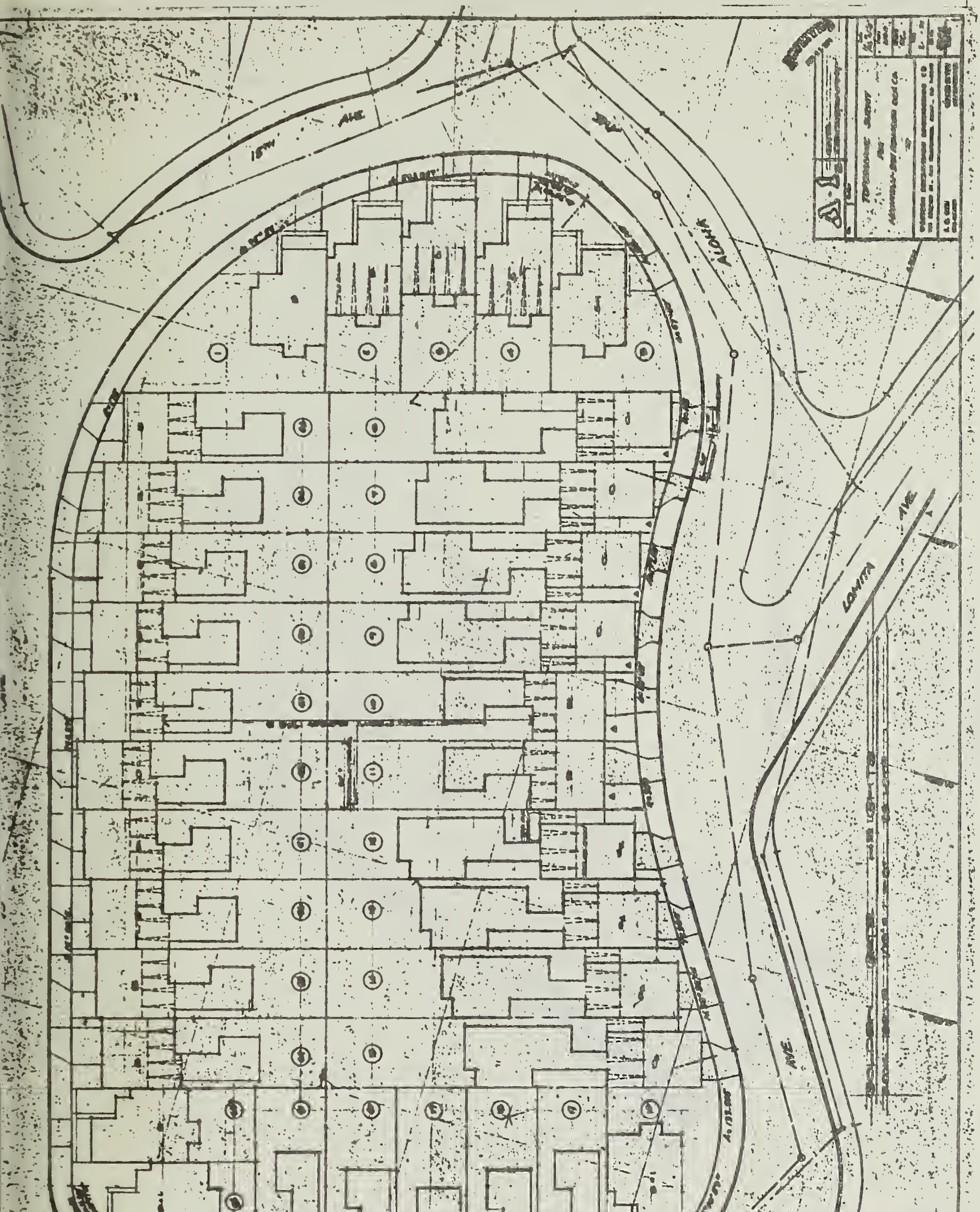


FIGURE 12

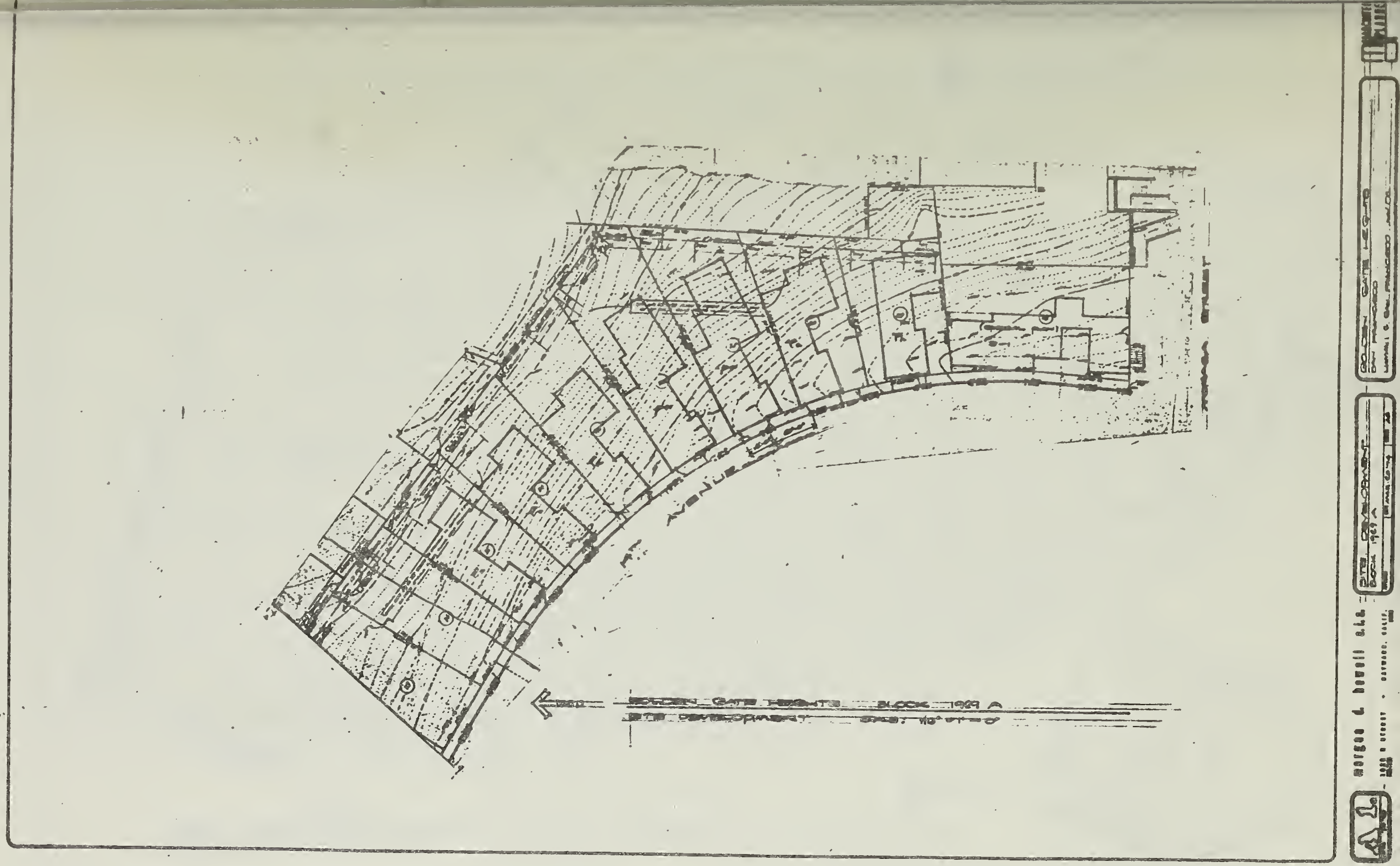

AVENUE
STREET
GOLDEN GATE HEIGHTS BLOCK 1969 A
SITE DEVELOPMENT SCALE: 1/16" = 1'-0"
morgan & howell a.i.a.
SITE DEVELOPMENT
BLOCK 1969 A
GOLDEN GATE HEIGHTS
SAN FRANCISCO

FIGURE 13

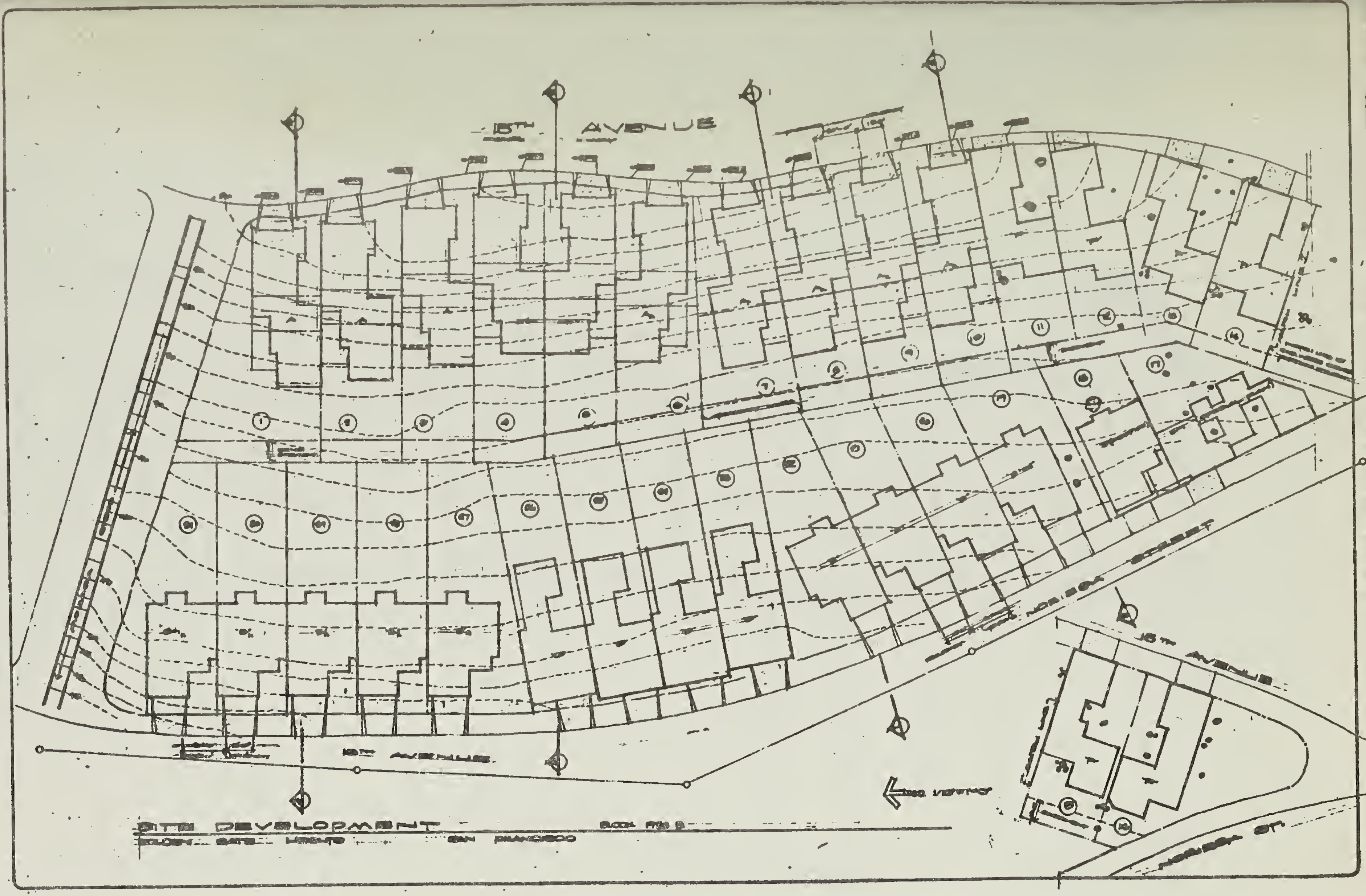

15th AVENUE
16th AVENUE
NORIEGA STREET
16th AVENUE
NORIEGA ST.
SITE DEVELOPMENT
GOLDEN GATE HEIGHTS
SAN FRANCISCO

FIGURE 14

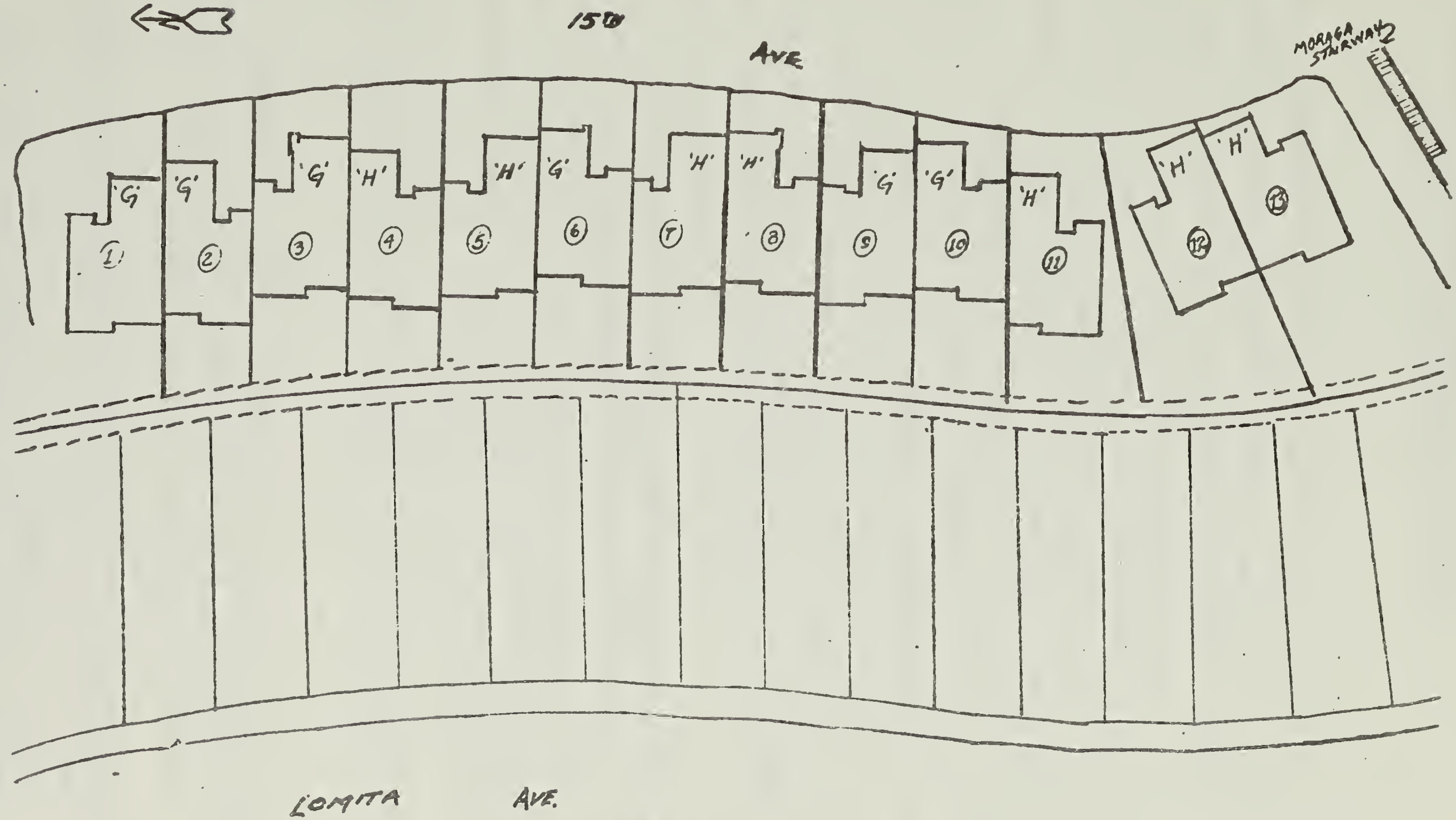


FIGURE 15
Block 1928

CHAPTER II

DESCRIPTION OF ENVIRONMENTAL SETTING

Topography

The city is located on a collection of hills which are a spur of the Pacific Coastal Mountain Range. Basically, the bedrock of this range known as the Franciscan Formation extends for hundreds of miles along the Oregon and California coast. The formation which may extend to depths of 50,000 feet is principally composed of shale, sandstone, and chert.* Beds of clay, serpentine, and conglomerate are often found in the formation. This bedrock is overlain with surface deposits of dune sand, ravine fill, beach deposits, alluvium, landslide deposits, and artificial fill.1/2**

San Francisco's summits are in effect islands in a sea of sand. The sand was blown by the sea wind, which forced it around rocky obstacles and up the seaward side of the higher hills. The highest sand dune is located at an elevation of over 600 feet, on the north-south ridge known as Golden Gate Heights near the location of the proposed project.2/32

Three of the four Assessors Blocks upon which development is proposed have the steep topographies typical of dune faces rising as much as 90 feet along their east-west axis from the street surface, while the fourth parcel is relatively flat and the hard chert bedrock is exposed as a result of extensive previous quarrying activities.

The proposed development sites range in elevation from 460 feet to 540 feet above sea level.

Geologic

With the exception of a minor deposit of fill material near the 15th Avenue portion of Block 1928B, and the exposed chert bedrock found on Block 1860B, almost all of the proposed projects

---

*Chert is a by-product of volcanic activity. It is a siliceous rock of chalcedonic or opaline silica which occurs in limestone.

**The reference notation system utilized throughout this report is as follows: The underlined number (1) refers to the reference work listed numerically following the Table of Contents, and the numbers following the slash (/2) refer to the page number within the work.

surface is of loosely compacted sand with varying amounts of silt and clay binder. Test borings completed by Jo Crosby and Associates, soil engineers, have indicated that where the chert is deep, the moisture content within the overlying sand tends to increase with depth. However, practically all of the sand encountered in the borings appeared to be loosely compacted. Deposits of sand are deepest at the lower proposed site elevations as the surface bedrock drops off steeply.

Basically, one active fault and three inactive faults trend northwesterly through San Francisco. As shown in Figure 16, the active fault is the San Andreas which lies in the ocean approximately four miles from the proposed development. No part of this fault transacts the land area of the city, however movement has occured along this fault several times in the past with devastating effects to areas of the city.

Of the area's three inactive faults* the City College fault is closest to the proposed development area. This fault, which passes within one mile of the proposed development site, trends northwesterly through San Francisco's City College and out near Seal Rocks and is exposed in ground surface in Franciscan rock near the campus, but is concealed beneath the dune sands north of the campus.

The remaining inactive faults in the area include the San Bruno, which lies in the Franciscan bedrock from 300 to 1500 feet beneath Lake Merced and the Ft. Point-Hunters Point, which extends from the city's Bay View district to Lands End and is evident only in limited Franciscan formation outcrops along it's axis.[1/3]

Air Quality

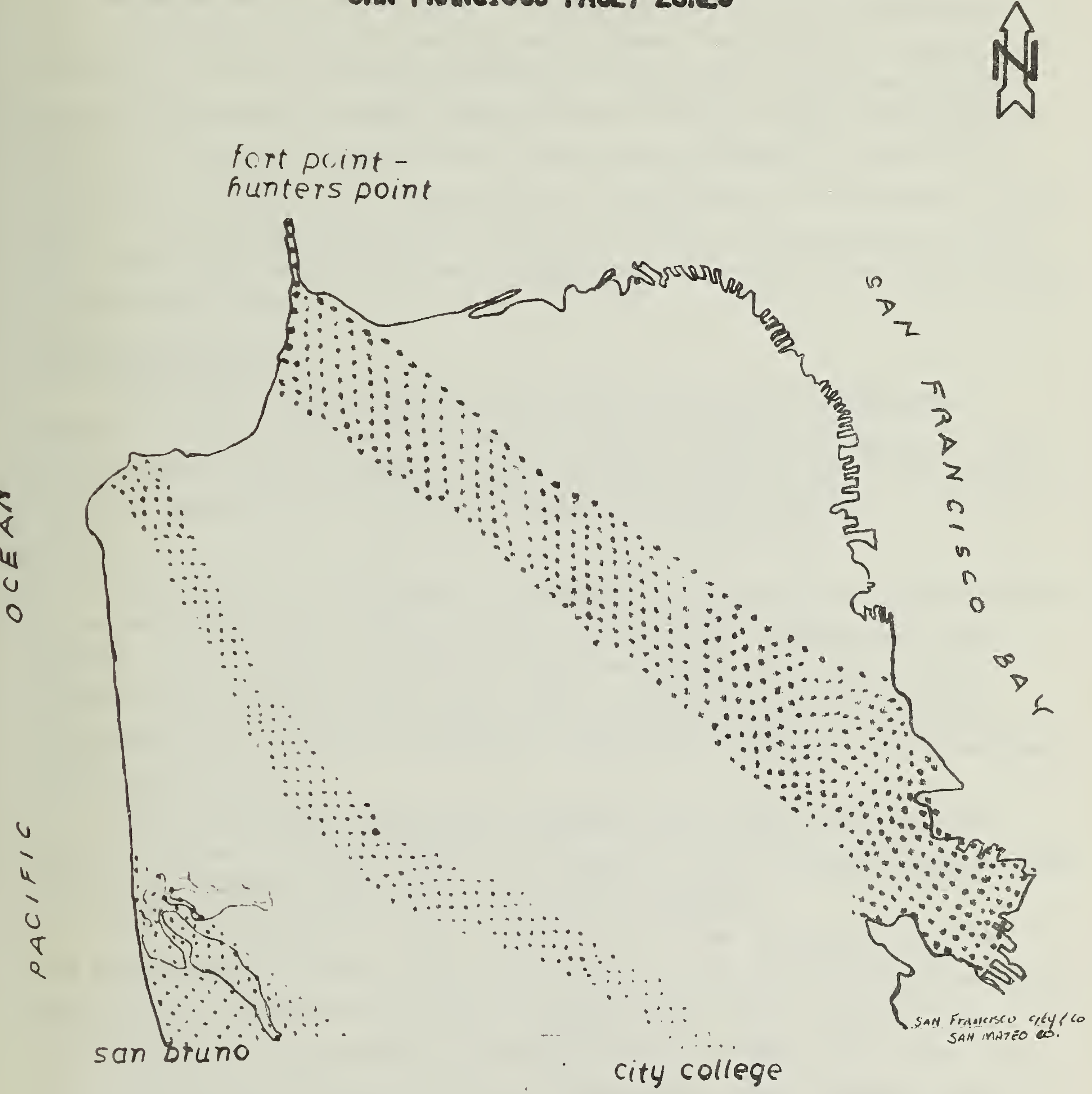
The proposed development site and the majority of the remaining areas of San Francisco enjoy relatively clean air as a result of climatic and topographic conditions and the absence of any significant upwind pollutors. Because of the city's nearness to the Golden Gate which affords the only sea level entrance through the coastal

---

*The inactive faults which occur in San Francisco are thought to be melange zones of ancient thrusting called subduction zones which date back to ancient times when the crustal plate occupying the Pacific Ocean was being thrust beneath the crustal plate of the North American continent.

FIGURE 16

SAN FRANCISCO FAULT ZONES



mountains into the interior, a relatively steady sweep of marine air with an annual mean rate of 9 mph prevents the accumulation of air pollutants and constantly replenishes the local air supply. However, air contaminants produced in the city are blown by the prevailing winds to other areas within the air basin contributing to one of the most serious air pollution problems in the nation. Although the majority of particulate emissions in the basin originate in the highly populated counties to the east and south of the Bay, San Francisco contributes approximately 12% of the total basin contaminant load.

Flora and Fauna

Although a densely populated area such as San Francisco presents a disturbed environment to plant and animal species, the city's remaining open spaces do present a wide range of relatively natural habitats for selected animal and plant species.

Flora

The California Academy of Sciences has identified seven "rare" or endangered plant species which may be found within the city limits. One of these species, the Dune Tansy, has been located within the proposed development site as the result of a survey conducted by Dr. Dennis Breedlove, Associate Curator of the Academy, during May, 1974.

The Dune Tansy, (Tanacetum Camphoratum) which was located within Assessors Block 1928B is a member of the Coastal Strand plant community which consists of twenty-four species.

The Dune Tansy is "rare" by virtue of the disappearance of the specialized habitat which it favors. Once the Tansy flourished among coastal dunes as few other species actively competed for existance in an environment characterized by high winds, poor moisture retention qualities of the native soils, and frequent salt water incursions. However, recent periods of rapid growth within the city and surrounding areas have generated intense construction pressures upon locations affording desirable habitats for this species.

The Dune Tansy is of a family of plants closely related to the

Sunflower. All of it's members are aromatic annuals or perennials and have dissected or fern-like leaves.

The plant is a dune stabilizing plant owing to it's extensive root system which often extends in excess of 35 feet in all directions. Dissemination of the species is accomplished both by airborne broadcast of it's seeds and through it's extensive root system. In addition to the Tansy, several plants native to the beach dune and bluff habitat of Central California are present on the proposed development site. These varieties of low groundcover form a soil stabilizing network where they appear. A list of these species appears below:

Yarrow
Pearly Everlasting
California Acaena
Sea-Pink
Beach Sagewort
Coyote Brush
Dwarf Chapparral Broom
Sand-Mat
Sea Lettuce
Sticky or Brush Monkey Flower
California poppy
Coast Buckwheat
Beach Strawberry
Blue Field Gilia
Cudweed
Mock Heather
Deerweed
Yellow Beach Lupine
Lupine
Blue Beach Lupine

In the southeast corner of Assessors Block 1928B a small grove of trees occurs. These trees, which are cypres, bay, and eucalyptus, and of various heights, are the only trees which appear within the proposed development area. A map, detailing the location, height, and species of these trees is available for inspection at the office of City Planning, 100 Larkin Street.

Fauna

Undomesticated birds and some terrestrial animals live and reproduce in the open areas of the city. Although some animals known to dwell in or visit the city are rarely sighted, none can be considered rare or endangered. The proposed development site does not appear to be a haven for any terrestrial animals although domesticated pets in the area do visit the site. Likewise, the site is visited from time to time by native birds.

Ground Water

Surface water or ponding is not likely over most of the proposed development site as the soil cover is highly absorbant and unsaturated by the local water table. An exception to this assertion may be the flat parcel of land found on Assessors Block 1860B which has been stripped of most of it's soil cover as a result of previous quarrying activities leaving the bare non-absorbant chert exposed. Water which might collect on this parcel as well as water which is not absorbed by the native soils of the other parcels proposed for development drains toward the streets thence to the catch basins and the city's combined sewer system.

Land Use

The entire proposed development site of approximately ten acres is situated within census tract 303 of the San Francisco-Oakland Standard Metropolitan Statistical Area (SMSA), as illustrated by Figure 17. This tract covers a land area of 330.48 acres which is less than 2.0% of the city's total land area. The predominant land use within this tract is residential with over one-half of it's total area zoned for R-1 (One-family Residential) use. Table 2, on page 25 illustrates the distribution of land uses throughout this census tract.

Population Characteristics

The 1970 population of census tract 303 was 8,579 persons. Average household size was found to be 2.5 persons, and typical family incomes were $13,485 annually. This compares to the city average family income of $10,503.[4/11]

Service Delivery Systems

Water

Water for the proposed development would be gravity fed from the Stanford Heights reservoir which has a storage capacity of 11 million gallons.[5/41] The average operating pressure in the area is 50 pounds per square inch.*

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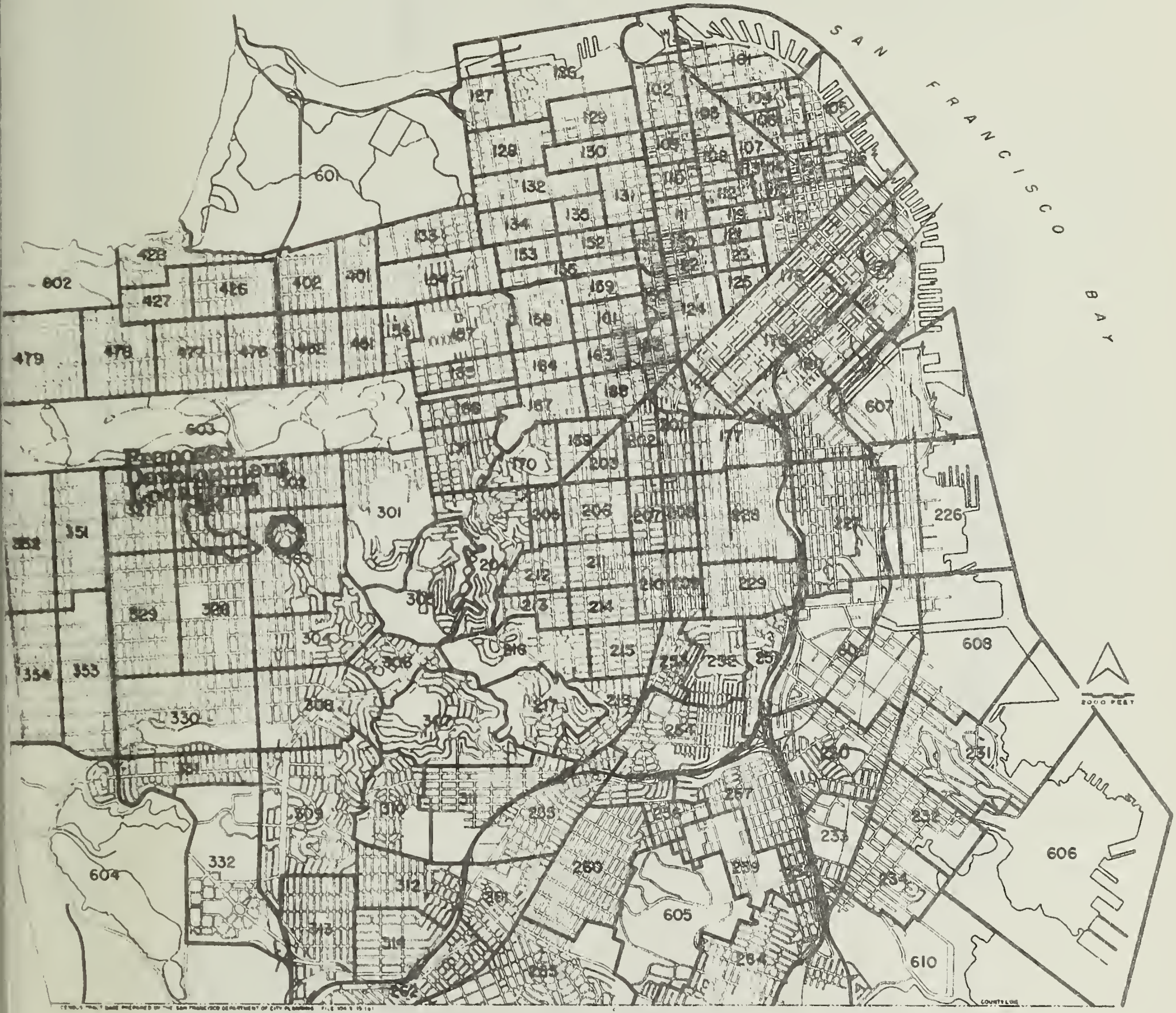
*Source: Telephone interview with John Medberry, San Francisco Water Department, 10/21/74

FIGURE 17



1970 CENSUS TRACTS

TABLE 2

Land Use Summary Census Tract 303

Zoned use	Acres currently in use	Vacant
R-1D	1.65	
R-1	152.02	19.86
R-2	49.98	1.03
R-3	15.91	.23
C-1	.90	
P	8.59	

Source: San Francisco Land Use Tabulation for 1970
San Francisco Department of City Planning

Police

San Francisco's Police Department is organized on a decentralized district station basis. The proposed development lies within the district served by the Taraval Station which is located at 24th and Taraval. Typical response time to calls within the proposed development is 3.0 minutes.*

Fire

Fire stations throughout the city have been located on the basis of population density. The area wherein the proposed development is located is considered a high density area by fire service standards and is served by three fire stations located at:

16th and Irving
18th between Quintara and Rivera
Clarendon and Olympia

Additional backup capability is supplied by the station located at Stanyan and Parnassus, which houses a complement of 12 fire engines/trucks.

Typical response time to a fire in the proposed development area is 4.5 minutes. A routine response would include a Chief, 1 ladder truck, and 3 fire engines.**

The city's fire service maintains a system of cisterns throughout the city which are designed to back up the domestic water supply for fire suppression, however, there are no cisterns within usable distances of the proposed development area. As a consequence, except for the 500 gallons of water carried aboard each fire engine, reliance upon the domestic water supply system would be made in the event of a fire within the proposed development atea.

Transportation

Vehicular

San Francisco's trafficways system is composed predominantly of an unlimited access, surface street network. Arterials extend from the city's downtown to the neighborhoods connecting at several

---

*Source: Police Facilities, San Francisco Department of City Planning, 1974

**Source: Telephone interview with Chief Gautier, San Francisco Fire Department, 5/30/74

points with the city's limited acess freeways, which serve to expedite traffic into, out of, and across the city.

Streets within neighborhoods have been developed in a grid pattern and connect to the arterials. Dominating topographical features tend to define the neighborhoods and the street patterns on the more rugged of these features are most often of irregular shape and length.

The proposed development would be located among the hills which dominate the Golden Gate Heights neighborhood. Street patterns in the immediate area of the development are irregular in shape and length. Additionally, they often intersect at steeply inclining or declining surface grades.

At the base of the hills (a maximum of 2 blocks from any point within the proposed development), the streets resume the grid pattern and are appreciably wider. Here, through routes are frequent as are connections with the arterials which serve the community. The major thoroughfares serving the community surrounding the proposed development include: Nineteenth Avenue, Lincoln Way, Taraval Street, and Seventh Avenue-Laguna Honda. The neighborhood is not served directly by any of San Francisco's limited access freeways.

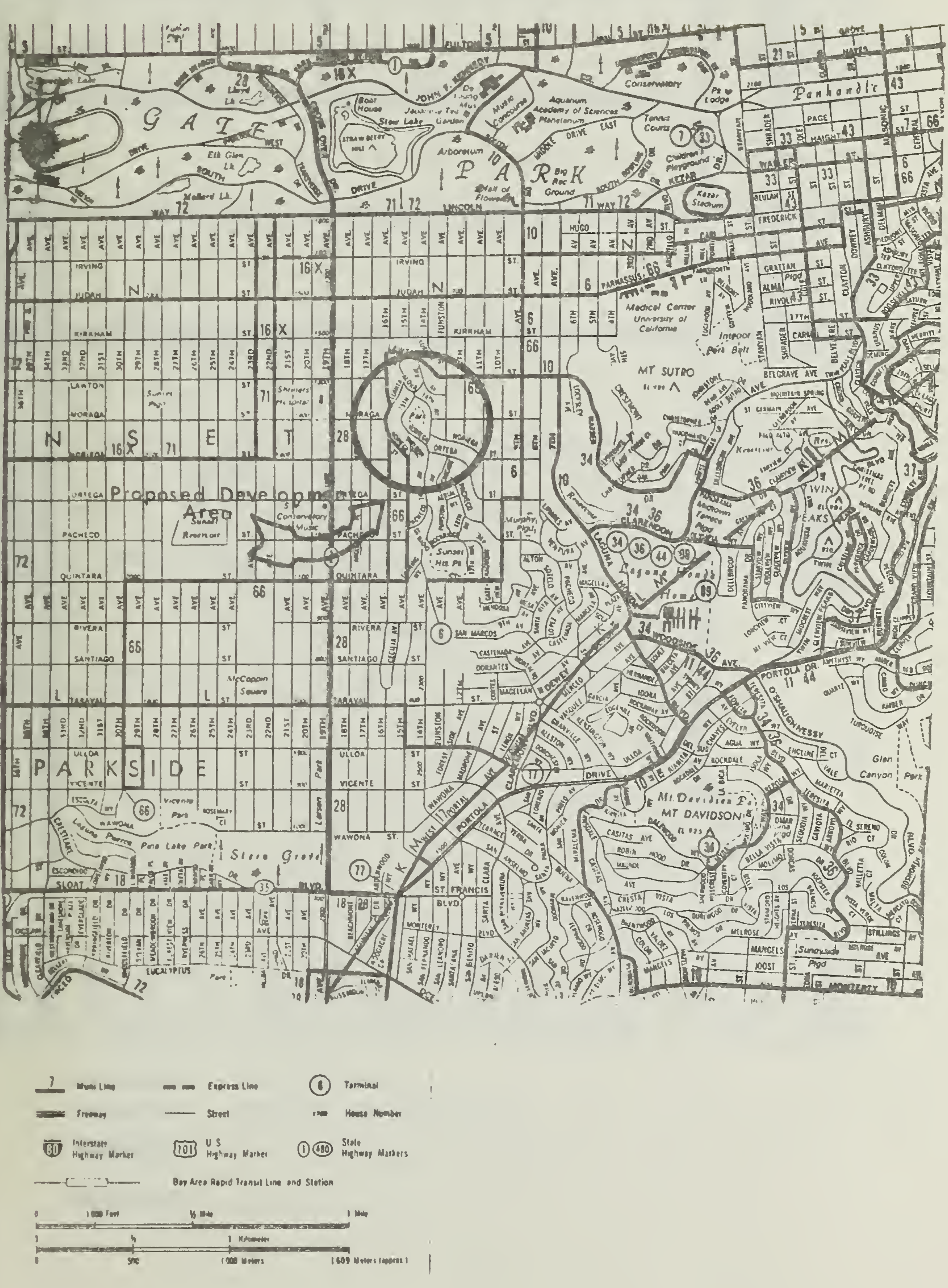
Mass Transit

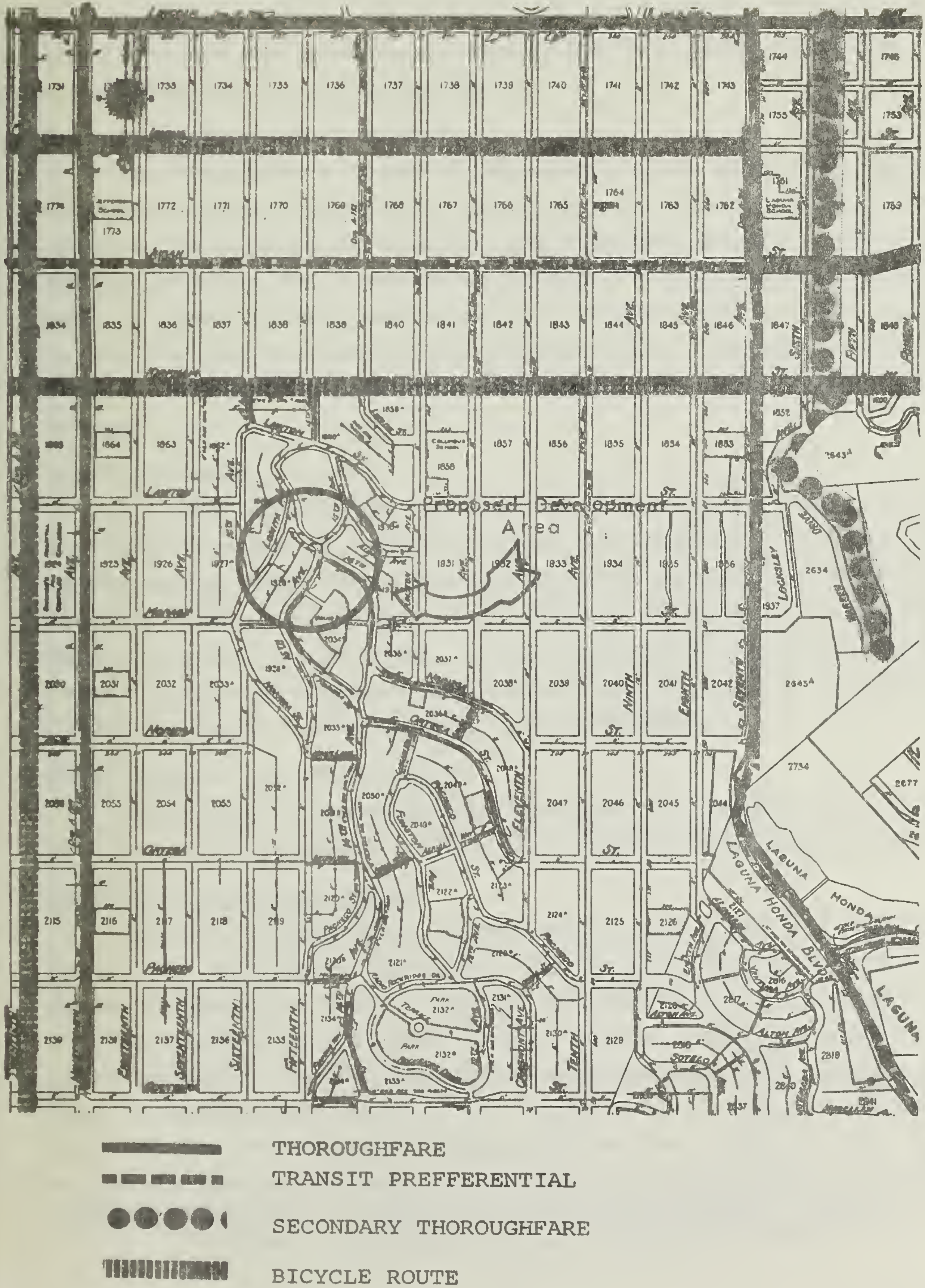
San Francisco's mass transit facilities are provided by a diversified surface system consisting of motor coaches, cable cars, trolley busses and streetcars, and by the sub-surface BART system. A majority of the City's mass transit routes enter downtown, however, some routes function as collectors connecting points within neighborhoods to downtown destined routes.

The proposed development is served by the #66 Quintara motor coach line, which makes several stops within the neighborhood and then proceeds downtown. Figure 18 illustrates neighborhood mass transit facilities. Also providing neighborhood service to downtown is the "N" Judah streetcar line, and the #6 Masonic motor coach, while the #28 Nineteenth Avenue provides cross-town transportation. Headways on the #66 Quintara line are 13 minutes during the A.M. peak (7 A.M. to 9 A.M.), 15 minutes during the day (between

FIGURE 18

AREA MASS TRANSIT ROUTES




Proposed Development Area
LAGUNA HONDA BLVD.
LAGUNA HONDA SCHOOL
COLUMBUS SCHOOL
ELEVENTH
TENTH
NINTH
EIGHTH
SEVENTH
SIXTH
FIFTH
FIFTEENTH
SIXTEENTH
SEVENTEENTH
EIGHTEENTH
LOCKSLEY
PACHECO ST.
ORTEGA
NORIEGA
MORAGA
KIRKHAM
ALTON AVE.
CRESTMONT AVE.
LAGUNA
THOROUGHFARE
TRANSIT PREFFERENTIAL
SECONDARY THOROUGHFARE
BICYCLE ROUTE

9 A.M. and 4 P.M.), 12 minutes during the P.M. peak (4 P.M. to 6 P.M), and 30 minutes during the night(7 P.M. to 7 A.M.). Capacities for the lines are 945 passengers during the A.M. peak and 1,050 passengers for the evening peak.*

Transit Prefferential Streets

San Francisco's Board of Supervisors has adopted an ordinance recommended and developed by the Planning Commission designating certain trafficways as Transit Prefferential Streets. This designation provides for a system of restricted parking and establishment of lanes for the exclusive use of mass transit particularly during the A.M and P.M. peak movement hours. Transit prefferential streets serving the proposed development are Judah Street and Seventh Avenue.

Bicycle Routes

In order to provide for the use of the bicycle as a viable alternative means of transportation, in addition to it's recreational value, some city streets have been designated and marked as bicycle routes. Existing bicycle routes serving the proposed development are Irving and Judah, while Parnassus and Seventh Avenue-Laguna Honda are proposed for future improvement and designation. Figure 19 depicts area special use trafficways.

Other Special Use Trafficways

There are no recreational or pedestrian walkway streets in or known to be proposed within the proposed development area.

Recreation and Open Space

The City's Department of Recreation and Parks maintains many facilities throughout the city. The facilities range from world famous Golden Gate Park, which is the city's major open space area, to neighborhood playgrounds, tennis courts, and mini-parks. Within close proximity to the proposed Development location is Grand View Park, a medium-sized park of 1.1 acres, which affords magnificent views of the entire city. This park has been proposed for expansion by the Recreation element of the city's Comprehensive Plan however

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*Source: Telephone interview with Mr Tom Standing, Transit Planner, Municipal Railway (October 2, 1974)

the proposed expansion does not involve any lands of the proposed development.

Schools

The San Francisco Unified School District, in compliance with court-ordered desegregation of the city's public schools, operates an extensive bussing program. As a result, students from all over the city are bussed within certain grades to schools outside their immediate neighborhoods. Consequently, average daily population figures for a given school do not reflect the densities of school-age children residing in the area.[9/x]

The probable school assignments for students residing in the proposed development are as follows:

Kindergarten thru Grade Three (K-3)	Bussed*
Grades Four thru Six	Columbus Elementary
Junior High (7-9)	Herbert Hoover Jr.
High School (10-12)	Lincoln or McAteer High

Locations of these facilities and current enrollments are displayed below.

Facility	Location	Current Enrollment	Capacity
Hoover	2290 14th Avenue	1350	1666
Lincoln	24th & Quintara	1800	3114
McAteer	555 Portola	1700	2569
Columbus	1451 12th Avenue	230	360
Jefferson	1725 Irving	441	540

Source: Telephone interview with Mr Clay San Francisco Unified School District, 5/30/74

Waste Disposal (solid)

The City and County of San Francisco contracts for the collection and disposal of domestic solid waste through the office of the Director of Public Works. The Director reviews the operations of competing privately owned scavanger companies and approves a rate they may charge individual citizens of the City and County for collection and disposal of their waste.

Currently, the Sunset Scavenger Company has been authorized to operate within the proposed development area. Refuse collected by the Sunset Scavenger Company is disposed of at the Mountain View landfill operation located in Santa Clara County.

Waste Disposal (liquid)

San Francisco collects it's domestic, industrial, and storm run-off wastewater in a combined sewer system, and treats them at three sewage treatment plants situated along the periphery of the City. These plants, each of which serves the drainage basin wherein it is located, are illustrated by Figure 20.

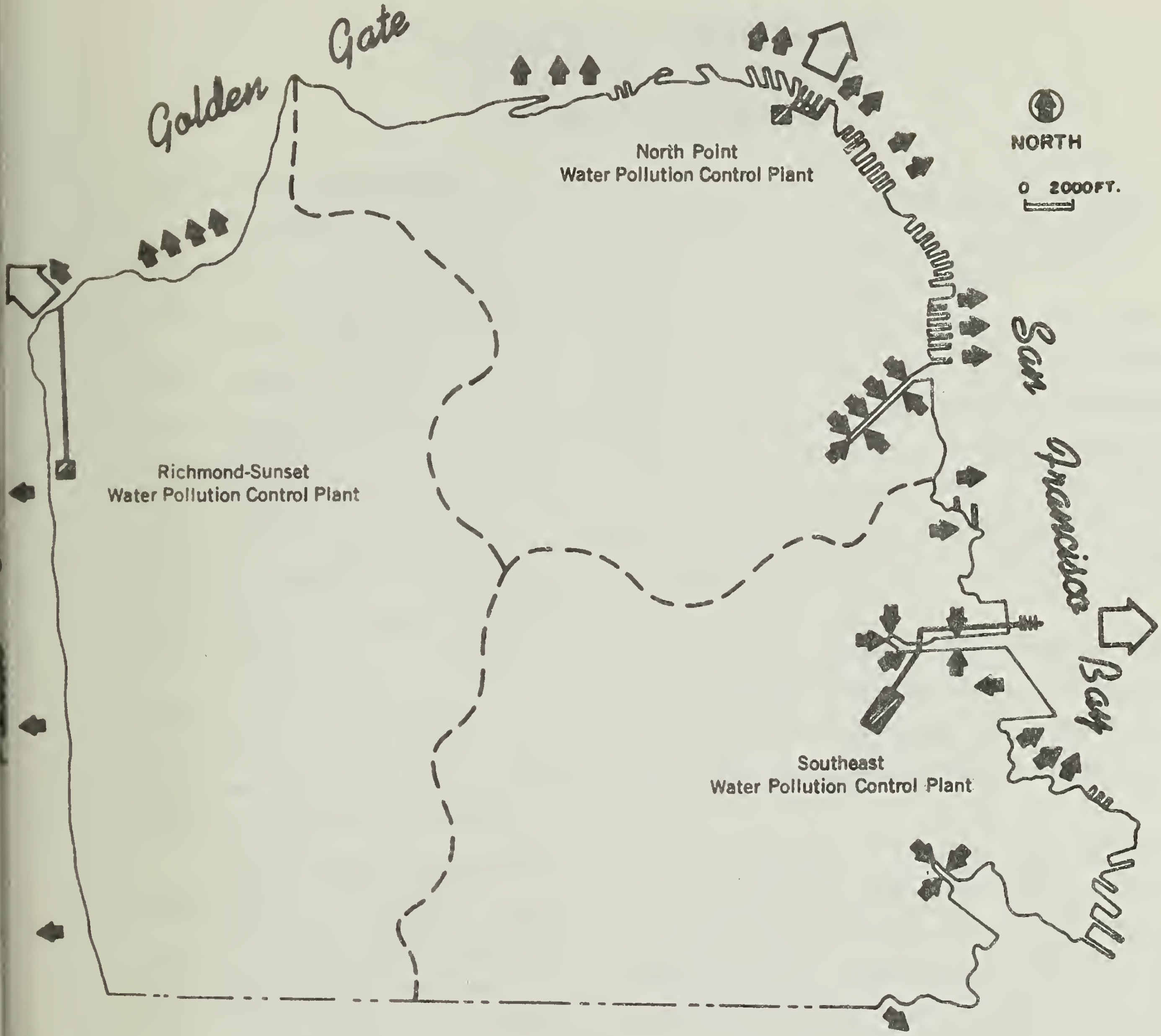
Presently, during dry periods, all wastewater is collected and treated at the three treatment plants. When rainfalls more intense than 0.02 inches per hour over the City occur, a storm run-off is produced which exceeds the system's 340 Mgd treatment capacity. During these periods the plants treat approximately 60% of the total wastewater flow, however that portion of the combined flow which is not treated results in large amounts of bacteria, grease, and untreated human wastes being deposited along the shoreline particularly in the beach areas of the City.

These overflows which occur approximately 80 times per year are responsible for adverse water quality conditions which render the beach areas of the City unfit for human water contact activities during most of the winter months.

Currently, the City under the weight of several Cease and Desist orders issued by the Regional Water Quality Control Board (RWQCB), has developed a master plan for expanding treatment facilities, which when completed will limit storm overflows to approximately eight occurances a year. This project is expected to require twenty years to complete.

Domestic and storm run-off flows likely to be produced as a result of the proposed development will be treated at the City's Richmond-Sunset water pollution control facility.

EXISTING TREATMENT FACILITIES


Golden Gate
North Point
Water Pollution Control Plant
NORTH
0 2000FT.
San Francisco Bay
Richmond-Sunset
Water Pollution Control Plant
Southeast
Water Pollution Control Plant

The existing three treatment plants (North Point, Southeast, and Richmond-Sunset) provide primary treatment with chemical addition and discharge through the outfalls shown on the map. Located around the perimeter of the City are solid arrows representing the existing 41 bypass locations. At these points a combination of untreated domestic wastewater and stormwater overflows into the Bay and Ocean when rainfall exceeds 0.02 inches per hour. Overflows occur approximately 80 times per year.

Chapter III

ENVIRONMENTAL IMPACTS LIKELY TO OCCUR IF THE PROPOSED PROJECT IS UNDERTAKEN

Basis for Calculation

In order to calculate the problematic effects the proposed development may have upon the environment, certain assumptions relative to the anticipated population have been made.

These assumptions have been based upon the financial status most likely to be enjoyed by qualified buyers and characteristics reflected by purchasers of similar homes in a development recently completed by UC Development Company on the lower slope of Assessors Block 1928A. These three and four bedroom homes which are very similar in architecture to those of the proposed development, although slightly smaller, have been marketed for $78,000 to $82,500, dependent upon the model selected.

Profiles of the purchasers to date reflect: An average family size of 4.5 persons, annual family incomes of $35,000+, typical down-payments of $20,000, and mortgage payments ranging from $650 to $800. Average ages of the children could not be established, however, both adults typically worked.*

This family profile is not in conflict with the surrounding community. Although recent census data reflects family income levels generally regarded as middle income ($13,485 annually), allowances must be made for a significant single population within the tract living on fixed incomes.[9/7] Making allowances for these persons leads to the inference that many resident wage earners are upper-middle-class to well-to-do.

Recent selling prices of the new and used housing in the immediate area of the proposed development have been in excess of $80,000. A typical down payment for such a purchase would equal $16,00 (20%) and a 30 year mortgage (if available) would require payments of $650 monthly. Lending institutions would most likely require annual family incomes of $25,000 to $35,000 to support such loans. Probable impact calculations assume that the typical

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*Source: Telephone interview with Mr McCormic, U/C Realtors 5/30/74

purchaser of a home within the proposed development will display similar financial and family composition characteristics. In summary, the probable composition of the typical family likely to purchase a home in the proposed development will be composed of 4.5 members, two of whom will work and earn an annual income of $35,000, and the statistical 2.5 children per household will attend public schools.

Below are the impacts which could reasonably anticipated to occur should the proposed development be completed.

Seismic

The greatest potential danger to human life during an earthquake is that of being struck by falling construction materials occasioned by the collapse of walls, ceilings, and/or whole buildings.

Geologic hazards associated with earthquakes such as liquefaction and land sliding may be damaging to property, however, except from being trapped within a collapsed structure the greatest danger to persons remains that of falling construction material occasioned by ground shaking.

Buildings constructed of brittle materials and containing inadequate connections between roof and walls are most vulnerable to heavy damage during the severe earth shaking associated with seismic disturbances.[4/60]

History has shown that in general small woodframe buildings with many partitions such as those proposed for the development have good earthquake resistance, even though they can move a great deal during a disturbance and, in so doing, sustain some damage.[4/61]

The proposed development site is subject to liquefaction under moderate to heavy seismic loadings which would probably cause damage to the proposed dwellings, but not collapse.

Landsliding is not thought to be likely in the vicinity of the proposed development as the Franciscan bedrock, while composed of chert, is not sheared and is regarded as quite stable.[4/Fig. 4]

Finally, the major portion of the site is covered with a dense layer of sand which provides excellent shock absorbing qualities to structures it supports during periods of seismic disturbance. As

a consequence, the proposed development is expected to sustain but slight damage in the event of a 1906-level seismic disturbance on the San Andreas fault.[4]/Fig. 3

In conclusion a major seismic occurance may cause, within the area of the proposed development, property damage due to earth shaking, fear and possible panic to occupants and disruption of some public service or utility delivery systems. Potential hazard to life, however, is thought to be slight.

Land Forms

The four Assessors Blocks upon which the proposed development is to be constructed display two vastly different topographies (See Figure 3). Blocks 1929A, 1928, and 1928B are situated upon steep slopes which rise rapidly from the street surface, while Block 1860B is relatively flat and the site of an abandoned quarry operation. Some alteration to existing land forms will be required.

Those sites which are on the downhill side of Block 1928B and the entire surface of Block 1860B are to be excavated, leveled, filled and recompacted.

This activity will necessitate the reduction and covering of exposed bedrock outcroppings on Block 1860B, however, little or no alteration to the bedrock will occur elsewhere within the proposed development area as the surface soil depth extends to depths of fifty feet across the lower slopes. Present estimates are that no blasting will be required to reduce the outcrops. Figures 23 and 24 are grading plans of the proposed development.

Homes to be constructed upon the up-slope locations within the proposed development will utilize either spread footings or piers for structural support. These footings will be constructed by drilling through the sandy soil to the bedrock and then casting through the bore, pier, or cassion. See Appendix 3.

Erosion

The preparation of all sites involved in the proposed development require the removal of all native vegetation except the trees located on Assessors Block 1928B. See Appendix 3. Currently, this ground cover which is composed of species uniquely suited to the

GRADING PLAN

BLOCK 1928B

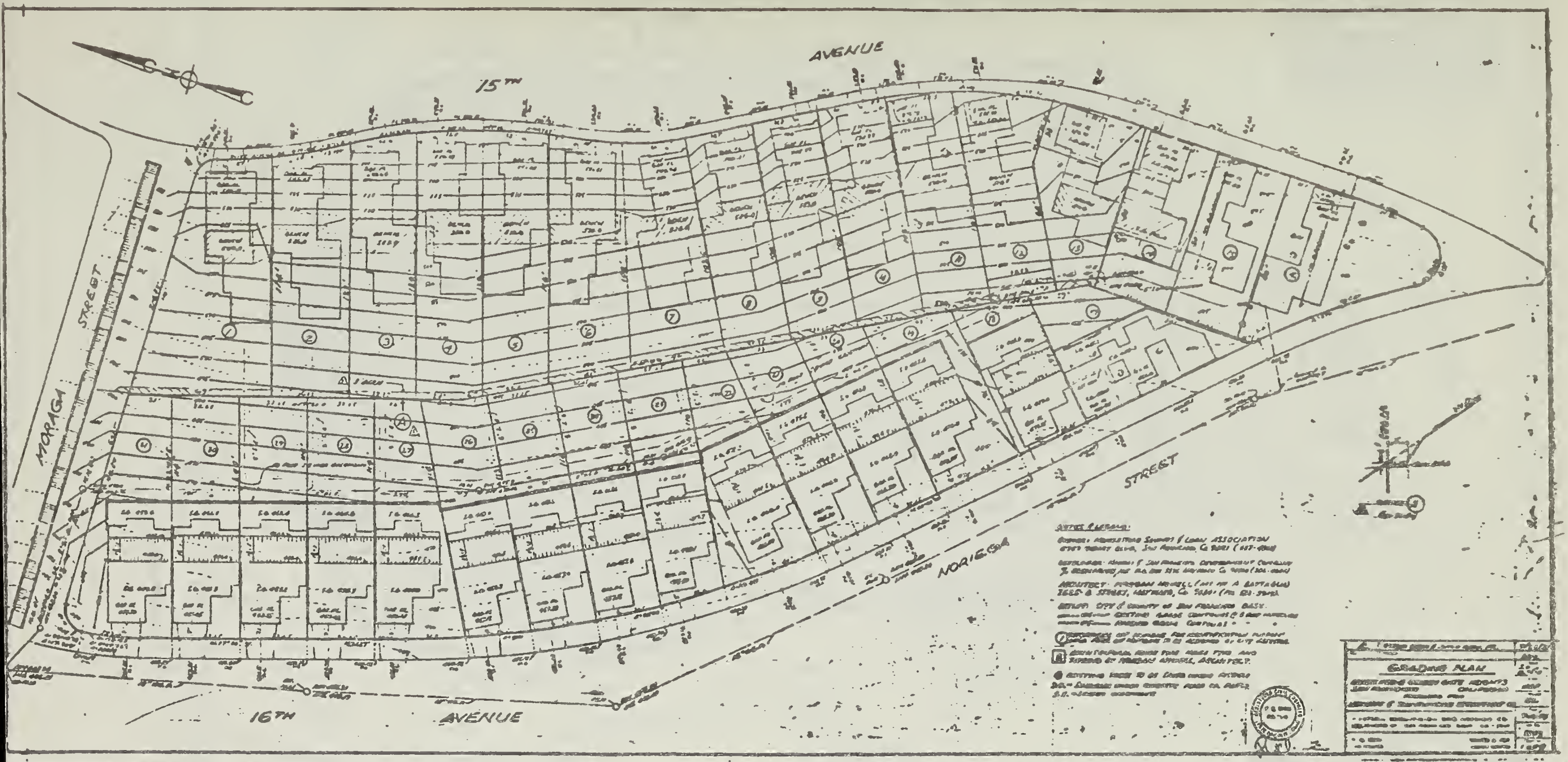

FIGURE 21

GRADING PLAN

BLOCK 1860B

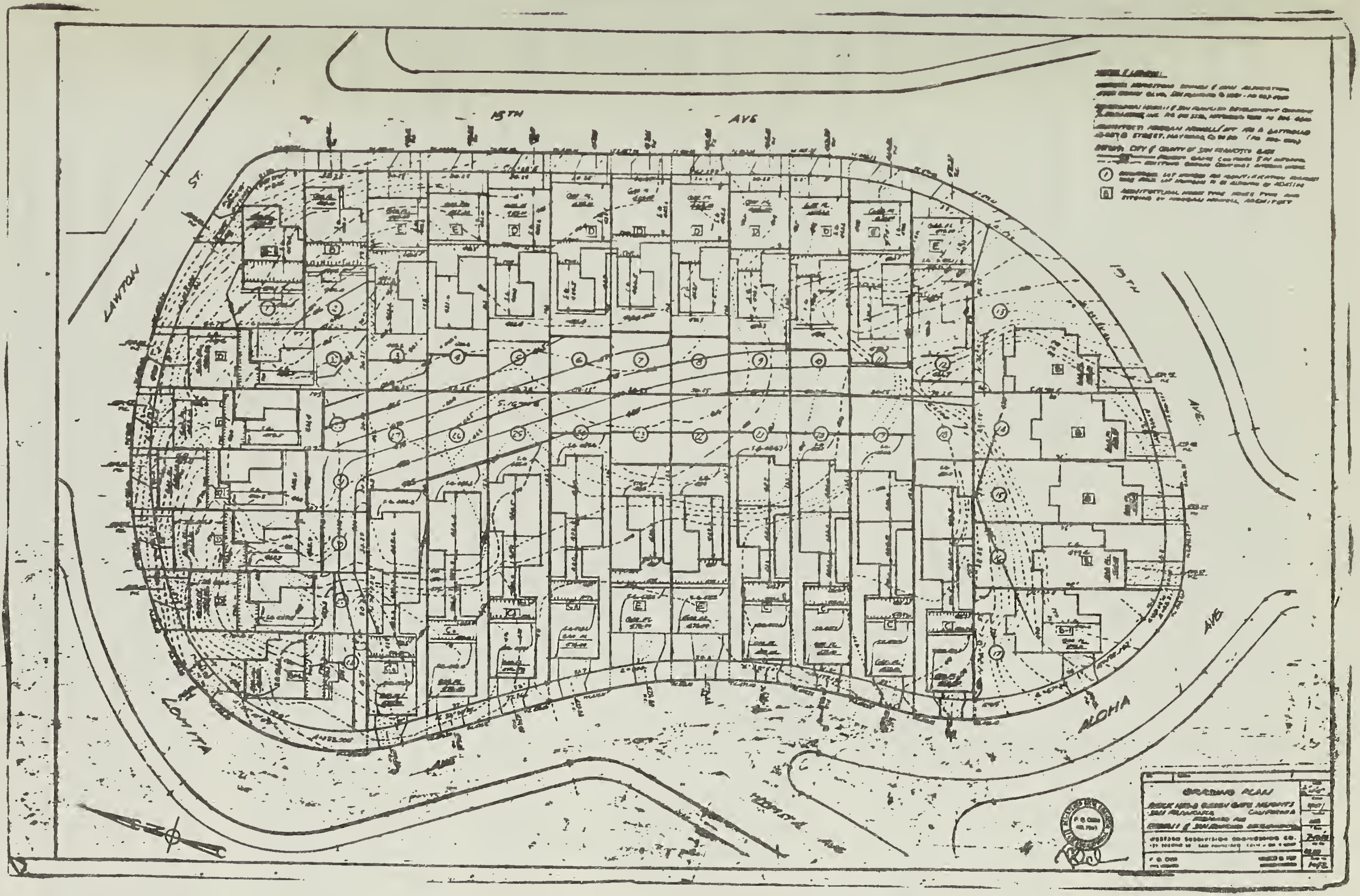

FIGURE 22

rather hostile environment afforded plant life by the site, limits the effects of water and wind erosion by virtue of extensive root networks which absorb excess moisture and tightly bind the native sand in place. Removal of this cover will render the site temporarily more susceptible to the erosive effects of wind and water.

Plant and Animal Life - Trees, Shrubs and Ground Cover

The existing ground cover, exclusive of the trees, found on three of the Assessors Blocks associated with the proposed development will be removed completely. Assessors Block 1860B is currently stripped of much of it's ground cover as a result of extensive previous quarrying activity. That cover which remains will also be removed.

Rare or Endangered Plant Species and/or Communities

As previously discussed at length in the Environmental Setting portion of this report (Chapter II), one plant species currently dwelling upon the site of the proposed development, is considered rare and endangered. This is the "Dune Tansy." As site preparation procedures include the removal of all native vegetation, this plant species/community would be destroyed.

Open Space and Undeveloped Natural Areas

Three of the Assessors Blocks associated with the proposed development, display relatively natural features while the fourth evidences extensive previous quarrying activity,

Although all Blocks are open, accessible to the public, and contribute a feeling of openess to the general area, several visits to the site have evidenced little use currently being made by the general public. Nevertheless, development of the proposed site will reduce the city's inventory of open space by approximately ten acres.

Scenic Views

With the exception of Assessors Block 1860B, the proposed development sites are up-slope of existing structures within the area. A significant portion of Block 1860B is also above neighboring structures and therefore currently impedes views toward the north and west. However, unobstructed views to the west (Ocean

Beach) are available to residents of dwellings located at 125, 115, 105, and 95 Lomita Avenue. These views would be partially obstructed by the completed proposed development.

The structures proposed for development on Assessors Block 1929A will partially obstruct views toward the south currently available to residents of dwellings located at 1717, 1721, 1725, and 1733 14th Avenue, however, these homes are orientated for views toward the west.

No other scenic obstructions will be occasioned by the completion of the proposed development.

Views of natural areas currently being enjoyed by residents of and visitors to the proposed development area, include the actual sites of the proposed development. Development would of course eliminate these views.

Drainage and Run Off

It it's developed state, the proposed project will increase surface run off to the City's Richmond-Sunset Waste Water Treatment facility as a result of storm activity by approximately 4.6 million gallons annually. This estimate is based upon the following assumptions:

(a) Rainfall within the proposed development area is equal to the rainfall recorded by the Federal Building's rain gauge.

(b) Currently, surface soil in the proposed development area absorbs 100% of all rain fall and exposed areas will continue to do so.

(c) Rain falling upon covered areas of the proposed development area will be diverted to the City's combined sewer system.

Currently, 6.1 million gallons of rain water fall upon the proposed development area annually.

Air Quality

During the construction period of the proposed development, some deterioration to local air quality can be anticipated due to particulate emissions from motorized construction equipment and to the blowing of loose sands.

Over the long term, diminished local air quality can be anticipated due to the addition of as many as 166 privately-owned motor vehicles* to the area by residents of the proposed development.

Police Protection

Despite the relatively large population served by the Taraval Station which serves the site of the proposed development, the station has the lowest staffing level of any station in the City. This is the result of low crime experience in the past.

This situation is probably due to any number of causitive factors. However, the proposed development, with it's increased youth population, could have an effect upon the area service requirements. No factual or statistical evidence exists to either support or refute such a contention.

Fire Protection

The addition of 83 residential structures to the area obviously increases fire protection responsibilities of stations in the area. Additionally, the narrow streets surrounding the area will make access of fire fighting equipment to the new residences difficult. However, present personnel, equipment, and water supplies in the area are adjudged sufficient.**

Water Consumption

The San Francisco Department of Public Works estimates per capita water consumption to be 137 gallons per day. Calculating based upon an average family size of 4.5 persons yields an estimate of 51,235 gallons per day consumption for the completed proposed development.

Solid Waste Disposal

Sunset Scavengers Association planning estimates are based upon daily individual solid waste generation of 2.5 to 3.1 lbs. per person.*** The 374 residents of the proposed development should generate 900 to 1 00 lbs of solid waste daily.

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*Estimate is based upon two cars per family.

**Source: Telephone interview with San Francisco Fire Department, Chief Gautier, 5/10/74

***Telephone interview with Sunset Scavengers Association, Mr. Cavagnavo, 12/12/74

Liquid Waste Disposal

The Department of Public Works estimates per capita sanitary waste flows at 125 gallons per day for residents of San Francisco.[11]/30 Based on these estimates, the proposed development would increase total sanitary flows to the City's Richmond-Sunset Treatment Plant by approximately .0047 MGD, representing a .002% increase of the average daily dry weather load. The Richmond-Sunset water pollution control plant is designed to accomodate up to 26MGD.

Schools

Meaningful estimates of the proposed development's impact upon local schools is difficult due to two factors. First, the actual ages of children within the proposed development are not known and, second, the effects of the school district's desegregation programs are not at all clear. Clearly there will be some impact, due to the introduction of 208 children to the neighborhood; however, educational facilities with the exception of the area high schools, are operating well below capacity and should the majority of the proposed development's children be assigned to area schools, they could be accomodated with relative ease.

Residents of the proposed development attending school grades Kindergarten through Third (K-3) would be bussed to Dudley Stone School, located at 1351 Haight Street. Currently, enrollment at Dudley Stone School is 430 students, while the facility capacity is 700 students.*

Energy

The proposed development would utilize natural gas for space heating purposes only. All other domestic energy requirements would be satisfied by electrical power. Both natural gas and the electrical power would be supplied by Pacific Gas and Electric Co. (PG&E).

Each unit has been designed for a connected load of 22 kilowatts (100 ampere mains), and is expected to consume 600,000 kilowatts of electrical energy annually. This would result in a total annual development consumption of 50.4 million kilowatt hours.

---

*Source: Telephone interview with Ms. Francis Campany, Clerk, Dudley Stone School 10/4/74

Electrical energy usage is expected to peak on a daily basis within the proposed development between the hours of 5 pm and 7 pm which reflects the normal period of peak residential electrical demand in San Francisco. Figure 24 illustrates this typical daily demand pattern.

Design estimates of the proposed development are for annual dwelling heating requirements of 1200 therms (a therm equals 100,000 British Thermal Units). Therefore, the proposed development's annual requirement would equal 99,600 therms.

The diversified supply sources utilized by PG&E to supply San Francisco's natural gas requirements furnish gas with heating values which range from 1,040 British Thermal Units (BTU) to 1,080 BTU per cubic foot. Consequently, the proposed development's annual natural gas requirements would range from 9.0 to 9.35 million cubic feet of gas depending upon the heating value of the supply sources. These sources are varied and mixed in accordance with availability and demand, and vary from day to day.

Projections are that the natural gas usage of the proposed development will be seasonal, based upon climatic conditions. Figure 25 depicts this predicted usage pattern.

Transportation

Vehicular

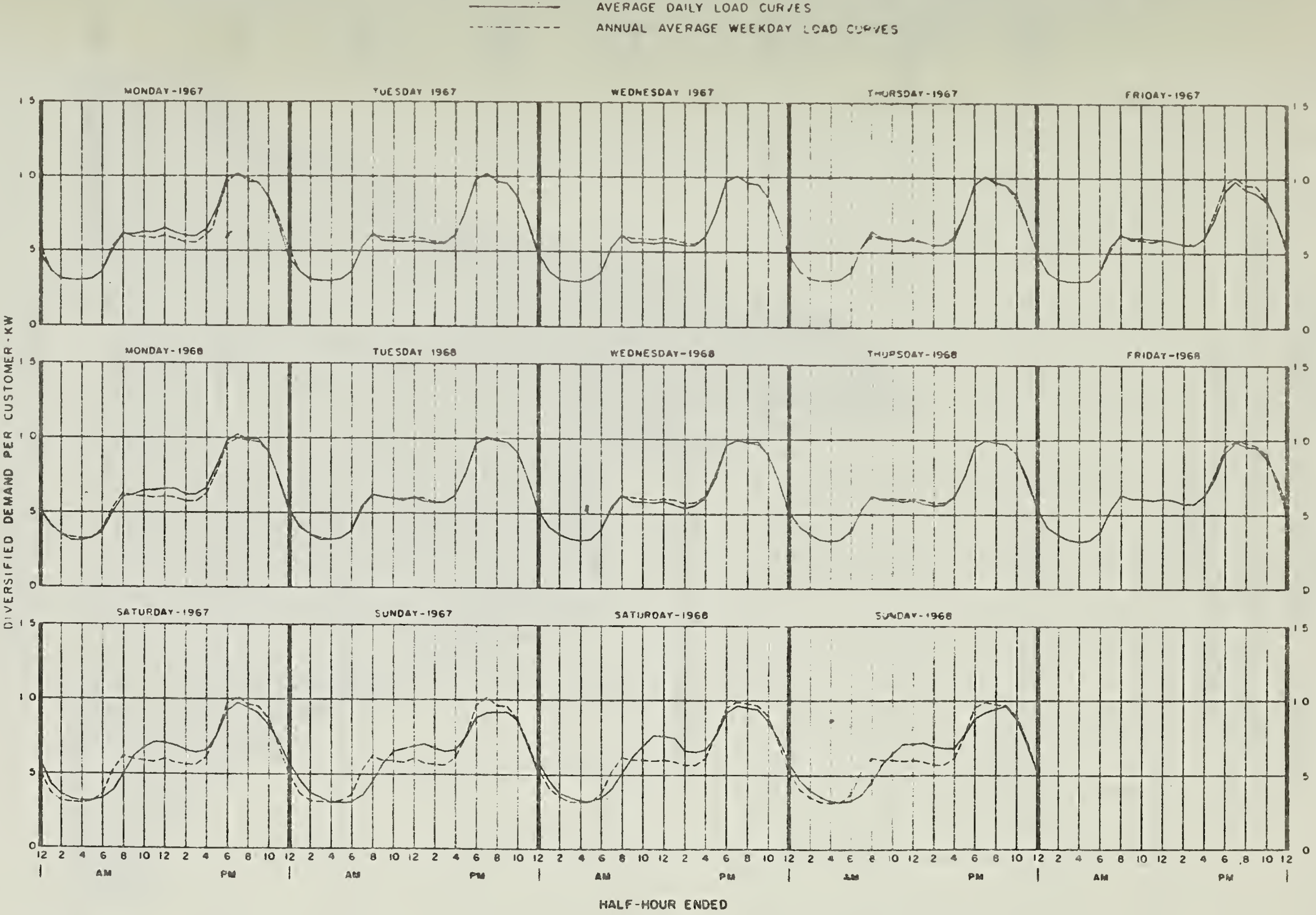
Traffic engineers within the City's Department of Public Works estimate that single family residential dwellings generate from six to eight trips daily, one of which will occur during the peak travel period which coincides with the evening rush hour. On this basis, the proposed development would generate an additional 498 to 664 daily trips.

Estimates by the Department of City Planning are that 50% of all trips by city residents will be accomplished by means of public mass transit. Making allowances for these modal preferences, we can project that approximately 249 to 332 additional automobile trips will be generated daily as a result of the proposed development's completion.

The street system within the proposed development area is

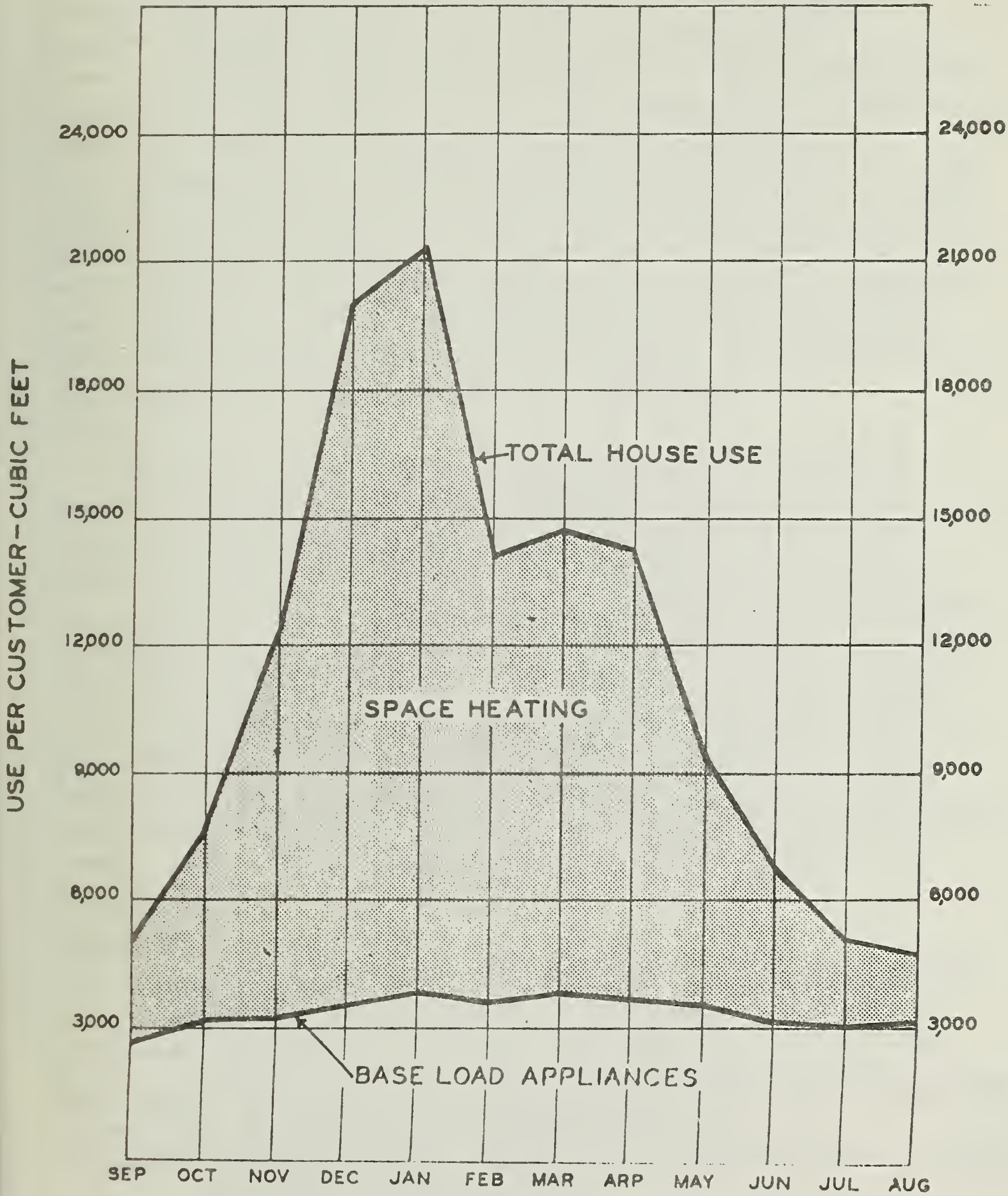
RESIDENTIAL SERVICE

COMPARISON OF AVERAGE DAILY LOAD CURVES TO ANNUAL AVERAGE WEEKDAY LOAD CURVES



Source: Residential Service Electric Load Characteristics Study Part II Pacific Gas and Electric Company Rate Research Department, 1970

RESIDENTIAL GAS SPACE HEATING
MONTHLY AVERAGE USE YEARS 1967-68
SAN FRANCISCO BAY AREA
P. G. & E.



Source: Residential Gas Appliance Load Research Project
Marketing Research and Services Department PG&E, 1970

FIGURE 24

capable of accomodating vehicular traffic at a minimum rate of 350 vehicles per hour.* When last calculated 44% of all trips per household generated within the neighborhood surrounding the proposed development were to the City's downtown area.[6/71] Assuming the modal split of 50/50, between 106 and 143 daily trips by privately owned vehicles to the City's downtown can be anticipated as a result of the proposed project's completion.

Through routes to downtown from the proposed project area are difficult and infrequent. The most probable route is the Lincoln Way-Oak Street corridor, while the most probable return route involves the Fell Street-John F. Kennedy Drive corridor. Currently, these routes are crowded and characterized by congestion during peak travel periods. Figure 26 details recent traffic peak-hour counts obtained at points along these trafficways.

Transit

Although precise ridership figures are not available, an interview with Municipal Railway officials indicates that the routes serving the proposed development directly, and routes likely to be affected by completion of the proposed development are capable of easily accomodating the additional patronage likely to be generated by completion of the proposed development. This increase should be between 249 and 332 riders daily. An exception to this generalization is the #28-Nineteenth Avenue motor-coach line, which is currently crowded during the am peak as a result of heavy usage by high school and college students. The proposed development is not expected to significantly aggravate this problem. However, plans are currently underway to expand service on this line.**

Parking

Currently, unrestricted curb-side parking is available at the street side of all sites proposed for development. A total of 162 spaces is available. However, these spaces are seldom used

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*Calculation based upon a one-way street, affording but one vehicular lane, and a 20 mile per hour maximum speed.

**Source: Telephone interview with Mr Tom Standing, Transit Planner, Municipal railway, 10/2/74

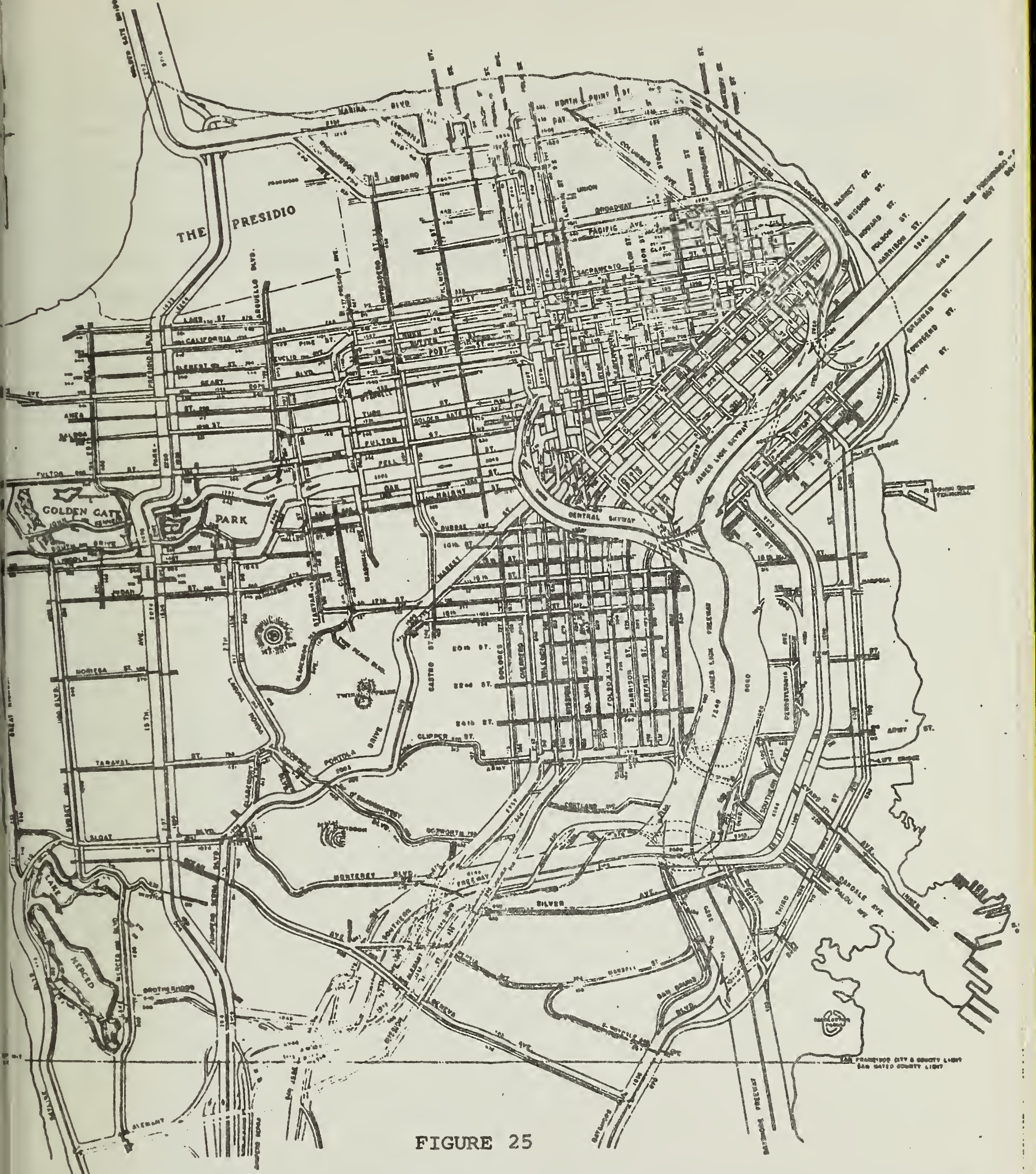

FIGURE 25

CITY & COUNTY OF SAN FRANCISCO
EVENING PEAK HOUR TRAFFIC FLOW
ON PRINCIPAL STREETS & HIGHWAYS
1969 - 1973

because virtually all dwellings in the immediate proposed development area have garages; most of them, two car garages. As a consequence, the currently available spots receive little use except for use by guests of the area residents.

The proposed development would reduce existing street-side parking opportunities by approximately 73, leaving a total of 89 spaces.*

---

*Calculation based upon 22-foot parking spaces which are mid-block standards for San Francisco.

MITIGATION MEASURES

The following mitigation measures are proposed to reduce the effect of certain adverse impacts likely to occur as a result of the proposed development's completion.

Soil Erosion

To mitigate the effects of soil erosion caused by wind and water, the native vegetation which will be removed as a result of site preparation activities will be replaced in uncovered areas by cultivated varieties of ground cover possessing soil stabilizing root systems similar to the varieties removed.

Mitigation measures to reduce the landslide or slope creep potentialities include the construction of retaining walls where steeply rising topographies exist, and the installation of a subsurface drainage system to collect excessive soil moisture occasioned by rainfall, and direct it to the City sewer system. See Appendix 5.

Rare and Endangered Plant Communities

As previously mentioned, a rare and endangered species (the Dune Tansy) currently flourishes on a portion of the proposed development site. The developer proposes to transplant this community to any location deemed compatible for it's continued existance. Arrangements will be made with the California Academy of Sciences to supervise such an undertaking.

Air Quality

During construction of the proposed development, local noise levels would be likely to increase. While this increase is for the most part unavoidable, the developer proposes to mitigate the adverse effects of such occurances by scheduling noisy construction activities for normal waking hours. The developer would conform to the requirements of Part II, Chapter VIII, Article 29, Sections 2907, 2908, and 2909, of the San Francisco Municipal Code, which

prescribes permissible noise levels for construction activities within residential areas.

Excavation

Although some excavation of the proposed development sites will be required, it would be held to a minimum by utilizing dwelling designs which require the least landform alteration.

Utilities

All utilities to be used by the proposed development would be delivered underground at the rear of the individual lots thereby eliminating the need for unsightly above ground facilities.

CHAPTER V

ALTERNATIVES

The Null Alternative

Alternatives to the proposed development include the null, or do-nothing alternative. Adoption of the null alternative would preserve the natural and open character of the sites proposed for development. Such a course of action, however, is not consistant with the developers financial goals.

Use of the Site for Open Space or Recreation Facilities

The proposed development site, while affording spectacular views of the City has relatively little value as a recreation or open-space facility in it's present state owing to it's steep topographical features. Nearby Grandview Park affords superior views and is readily accessible.

Utilization of these sites for open space or recreational purposes would also necessitate their removal from the tax rolls.

More Intense Site Development

The proposed development sites are within R-1 (single-family residential) zones. No more intense development than that proposed by the developer is permitted in such areas. As a result, a more intense development would require a change in the areas zoning status. Such an occurance is held to be highly unlikely by the developer.

CHAPTER VI

STATUTORY

Irreversible Environmental Impacts

The irreversible environmental impacts which would occur should the proposed development be permitted include:

> Destruction of the sites present natural character
>
> Minor, but nevertheless essentially permanent alterations of the landform
>
> Commitment of resources in the form of building materials and, natural and mechanical energy which are reasonably permanent in that they are but marginally recoverable.

Short-Term Use vs. Long-Term Productivity

The use of the land involved in the proposed project for residential development represents a long-term commitment. Barring unforseen calamity, the resulting residences should provide adequate shelter for many years in the future. Thus, residential development while representing the highest and best economic use of the land, also affords it's most productive long-term use, as the land has little value for agricultural or mineral extractive endevors.

Objectives of the City

The proposed development is in substantial conformity with the objectives of the City as outlined in the Urban Design, and the Residential elements of the Comprehensive Plan for the City and County of San Francisco. Additionally, the project has received favorable; master plan review, major projects analysis, and review of the plans and specifications by the City's Department of City Planning. The proposed development does not conflict with any known neighborhood plans.

Historic, Archeological and Architectural Resources

No locations appearing on the National Historic Register are

involved in the proposed development. Additionally, no sites designated by the City's Landmark Preservation Board as historicly significant are affected.*

The entire site of the proposed development is not known to have ever been developed. Consequently, no architecturaly significant structures are involved.

The State of California Department of Parks and Recreation's inventory of archeologically significant locations lists no sites within San Francisco county as being of archeological significance. However, contracts between the developer and the excavator will contain a clause providing for cessation of excavating activities and evaluation by professionally competent personnel should any such sites be discovered.

Growth Inducing Impacts

Growth inducing impacts normally associated with residential development of the nature of the proposed development, usually confine themselves to growth of retail community service types of commercial activity, typified by dry cleaning establishments, beverage and convenience food outlets, and specialty shops.

San Francisco's zoning ordinance restricts these activities to C-1 and less restrictive zoning districts, the nearest of which to the proposed development is located along 19th Avenue, and beyond on Taraval, and Noriega. (See Figure 27) Additionally, the proposed development is within close proximity to West Portal, and Irving Avenue, both of which are important neighborhood shopping districts while Stonestown, a major regional shopping center, is within easy and convenient automobile access and is directly serviced by the #28-Nineteenth Avenue motorcoach line.

Each of these commercial areas is highly developed. The additional residential population which might be introduced to the area as a result of the proposed development's completion represents a .76% increase in the residential population served by these facilities and is not expected to overburden them or generate pressure

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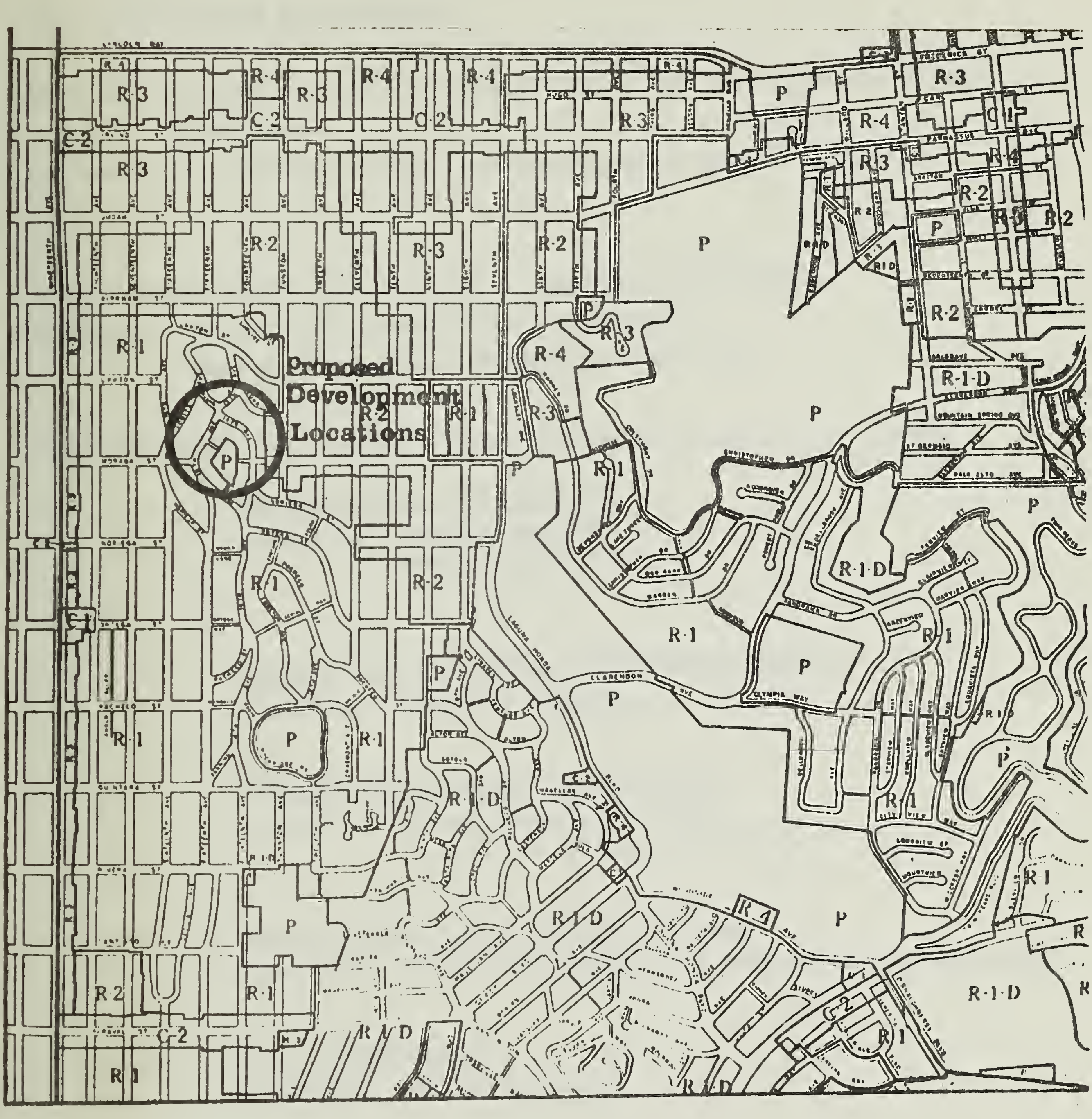
*Source: Telephone interview with Ed Michaels, Secretary, San Francisco Landmarks Preservation Board, 10/2/74

FIGURE 26


Proposed Development Locations
R-3
R-4
C-2
C-2
P
R-2
R-1
R-1-D
C-1
CLARENDON AVE
OLYMPIA WAY
CHRISTOPHER DR

for additional growth.*

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San Francisco Fire Department
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San Francisco Water Department

Contact: John Medberry

Municipal Railway

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Sunset Scavengers Association

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Dudley Stone School

Contact: Ms Francis Campany

CALIFORNIA ACADEMY OF SCIENCES
GOLDEN GATE PARK SAN FRANCISCO CALIFORNIA 94118
(AREA CODE 415) 221-5100

THE SCIENCE MUSEUM
THE ALEXANDER F. MORRISON PLANETARIUM
THE STEINHART AQUARIUM

Department of Botany

20 May 1974

Dear Mr. Stokes;

Enclosed find a list of the native plants found in assesors blocks 1860B,1928B and 1929 in the Golden Gate Heights. Aside from many weedy and adventive introduced plants which were not listed, there occurred many plants of the beach, dune and bluff habitat of central California. Although these plants are not endangered or rare this is one of the few remaining localities that they occur in San Francisco. These species are marked with a single asterisk. The next to last species in the list(double asterisk) is the very rare and very endangered species, the Dune Tansy. The location is marked with a red pen in block 1928B in the enclosed map. It does not occur any where else in the Golden Gate Heights. It is found in only a couple of localities in San Francisco and these also are threatened with construction.This is the range of the entire species.

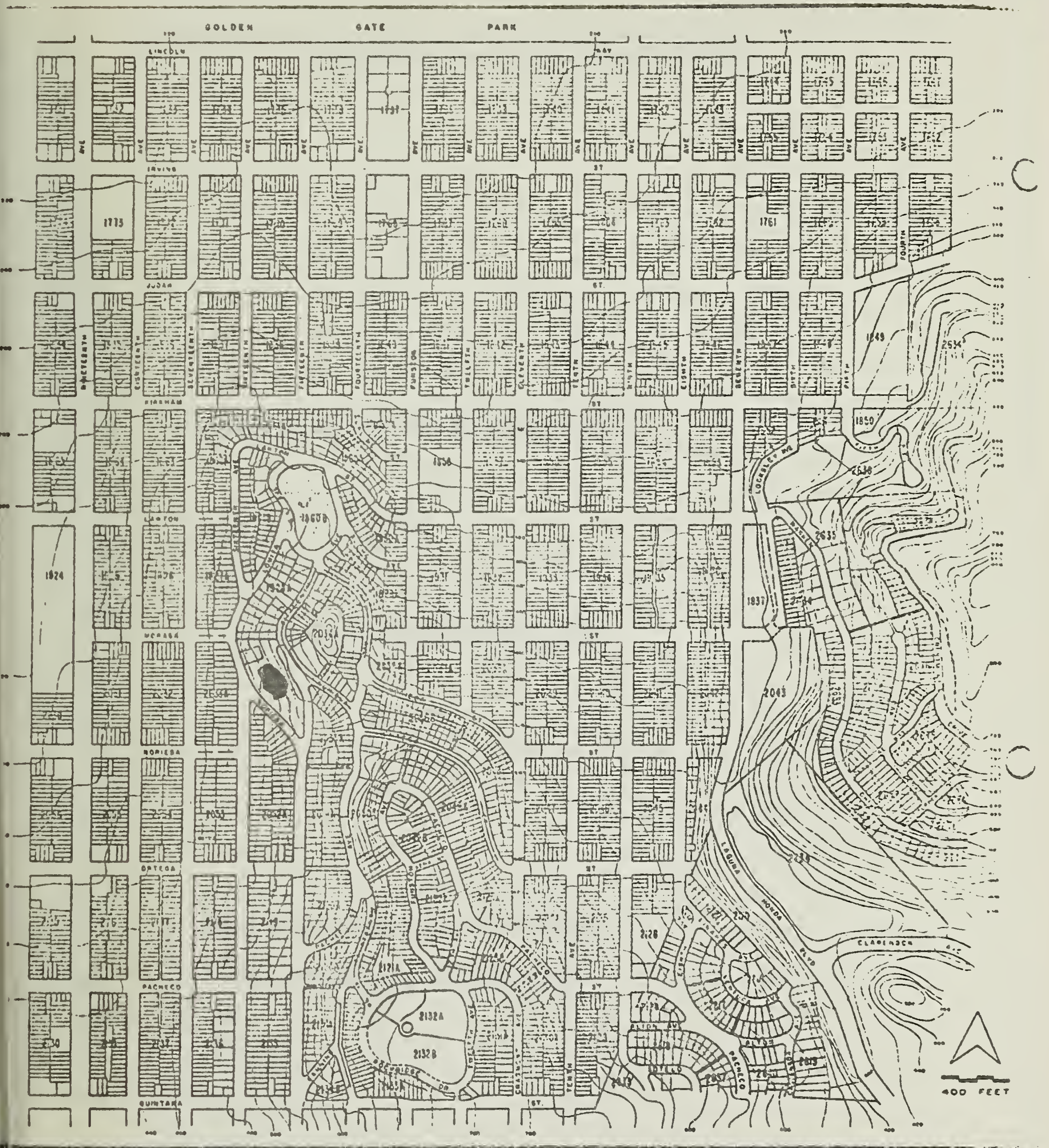
In all this work took eight(8) hours. My fee then is 200.00 dollars. I should explain that I did this work because Dr. Elizabeth McClintock asked me when she found she would be out of town for the next two weeks.

Yours Sincerely

Dennis E. Breedlove
Associate Curator

Achillea borealis Bongard	Yarrow
Acaena californica Bitter	California Acaena
Anaphalis margaritacea (L.) Benth. & Hook. f.	Pearly Everlasting
Armeria maritima (Mill.) Willd.	Sea-pink
Artemsia pycnocephala (Less.) DC.	Beach Sagewort
Baccharis pilularis var. consanguinea (DC.) Kuntze	Coyote Brush
Baccharis pilularis DC var. pilularis	Dwarf Chaparral Broom
Cardionema ramosissimun (Weinm.) Nels. & MacBr.	Sand-Mat
Dudleya farinosa (Lindl.) Britt. & Rose	Sea Lettuce
Diplacus auranticus (Curtis) Jeps.	Sticky or Bush Monkey Flower
Eschscholzia californica ~~Nutt. & Torr.~~ Cham.	California Poppy
Eriogonum latifolium Smith	Coast Buckwheat
Fragaria chiloensis (L.) Duchesne	Beach Strawberry
Gilia capitata Sims.	Blue Field Gilia
Gnaphalium chilense Spreng.	Cudweed
Haplopappus ericoides (Less.) H. & A.	Mock Heather
Lotus scoparius (Nutt.) Ottley	Deerweed
Lupinus arboreus Sims.	Yellow Beach Lupine
Lupinus bicolor ssp. umbellatus (Greene) C.P. Smith	Lupine
Lupinus chamissonis Eschscholtz	Blue Beach Lupine

	Marah fabaceus (Naudin) Dunn	Manroot
	Montia perfoliata (Donn ex Willd.) Howell	Miner's Lettuce
	Oenothera contorta Dougl. ex Hook.	Annual Primrose
	Oenothera hookeri T. & G.	Evening Primrose
*	Phacelia californica Chamisso	California Phacelia
	Phacelia distans Benth.	Wild Heliotrope
	Plantago erecta Morris	Annual Plantain
*	Polygonum paronychia C. & S.	Dune Knotweed
	Pteridium aquilinum (L.)	Bracken
	Rhamnus californica Esch.	California Coffee Berry
	Rubus ursinus C. & S.	California Blackberry
	Scrophularia californica C. & S.	California Bee-Plant
	Sisyrinchium bellum Wats.	Blue-Eyed-Grass
*	Tanacetum camphoratum Less.	Dune Tansy
	Toxicodendron diversilobus (T. & G.) Greene	Poison Oak



COMMUNITY AREA LAND USE STUDY

SUNSET HEIGHTS

COMMUNITY 12 · PLANNING AREA 3

JO CROSBY & ASSOCIATES 756 CALIFORNIA STREET (415) 969-3268
MOUNTAIN VIEW, CALIFORNIA 94040

FOUNDATION INVESTIGATION

for

HOMESTEAD SAVINGS AND LOAN

* * * * * * * * * * * * * *

Block 1928B, GOLDEN GATE HEIGHTS

SAN FRANCISCO, CALIFORNIA

* * * * * * * * * * * * * *

August 25, 1971

FOUNDATION INVESTIGATION

Purpose and Scope

The investigation was instigated to develop suitable design criteria for the planned one- and two-story single family residences on Block 1928B in Golden Gate Heights, San Francisco. The proposed development consists of 32 single family residential lots with appropriate facilities. The recommendations presented herein are based on the aforementioned information and a "Topographic Survey of Block 1928B, Golden Gate Heights, San Francisco, California, for Homestead Savings and Loan Association," prepared by Western Subdivision Engineering Company, dated July 9, 1971.

The scope of the investigation included test borings at selected locations, sampling of pertinent soil and rock strata, and appropriate laboratory testing. A geologic study complemented the program of drilling in the field. We feel that the work undertaken was adequate for the scope of the development. The data obtained was used to develop design criteria for the types of foundations, the bearing capacities of footings, lateral earth pressures, slabs-on-grade, drainage facilities, and general site grading. It should be noted that it is not uncommon to encounter unforeseen variations in the soil and rock conditions during construction. Such conditions frequently require additional engineering services for reviews and subsequent recommendations to attain a properly constructed project. For this reason, we recommend some contingency fund to be established to accommodate charges that may arise for any necessary additional engineering services.

Site Description

The San Francisco site, as shown on the enclosed Site Plan, is bordered on the east by 15th Avenue, on the south by Noriega Street, on the west by 16th Avenue, and on the north by Moraga Street stairway. The

upper portion of the property slopes steeply to the west with the lower portion sloping relatively gently to 16th Avenue. Low vegetation is growing over the entire site with a concentration of large trees in the southeast corner.

With the exception of a minor amount of fill material near 15th Avenue, practically all of the surface soil is a loose sand. The loose sand seems to be thinnest on the steeper slopes and becomes thicker on the lower and more gently sloping portions. There are also occasional outcroppings of sandstone and chert on the upper portions of the property.

Field Investigation

The field investigation included drilling a sufficient number of test borings with a track-mounted drilling rig at selected locations. Sampling was attempted by driving either a 2.425-inch or 2.00-inch diameter sampler into the desired strata with a 140-pound hammer dropping a distance of 30 inches. The information obtained by drilling and sampling was complemented by a geologic review of the site area.

Included in Appendix A are the logs of the test borings and the Site Plan indicating the locations of the borings and general geologic data.

Soil and Geologic Conditions

With the exception of the minor silty sand fill near 15th Avenue, almost all of the surface soil is a loosely compacted sand with varying amounts of silt and clay binder. Underlying the sand is hard chert. The depths to hard chert increases regularly from a few feet near 15th Avenue to over 50 feet near 16th Avenue. In locations where the chert is deep, the moisture content within the overlying sand tends to increase with depth. However, practically all of the sand encountered in the borings appeared to be loosely compacted. In addition, the contact zone between

hard chert and sand is a wet layer of weathered chert or clay.

There are two important geologic units on the site. One is a relatively recent deposit of dune sand, and the other is very dense chert bedrock of Jurassic or Cretaceous Age. The bedrock is exposed in the cut slope above the site. The chert is in contact with dense greenstone (an altered volcanic rock). The chert appears to continue beneath the sand on the site while the greenstone does not.

It appears that the bedrock [illegible] drops off very rapidly towards the bottom of the site where it is d[illegible] than 55 feet. The history of the site is probably like that of much of San Francisco, where dunes have moved across the low lying foothills obscuring the once rugged topography. A test boring located near Ortega Street and Nineteenth Avenue reported by the U. S. Geological Survey on their map entitled "Geology of the San Francisco North Quadrangle, California," dated 1958, shows sand and sediments extending to a depth of 105 feet before bedrock was encountered.

The San Andreas Fault is the nearest active fault and is located about four miles southwest of the site. The most significant major earthquake in this area occurred on April 18, 1906, and was generated by that fault. Our recommendations are based on the fact that this site is located in a potentially high seismic zone. Seismic design criteria as suggested in the current Uniform Building Code should be included in the design of the proposed developments.

Laboratory Analysis

Selected samples were tested in our laboratory to evaluate their characteristics. The tests included moisture content and dry density determinations, grain size analysis, and triaxial compression tests. The information obtained from the tests was used to develop the recommended design criteria presented in this report.

The results of the laboratory tests are presented in Appendix A for your reference.

Discussion and Recommendations

This report and the following recommendations have been prepared specifically for the aforementioned project to be constructed on Block 1925B in San Francisco. Normal construction procedures and loadings for single family residences were assumed in the engineering analysis and were the bases for recommendations presented herein. The design values reported are based on the on-site materials. Should some other source of material be used, we should be notified to review and, if necessary, amend these recommendations.

Should there be any alterations of the proposed construction, we should be immediately notified to review those alterations and, if necessary, submit appropriately amended recommendations. To minimize conflicts between our recommendations and the final building plans, we recommend a thorough review of the building plans by this office prior to construction.

General

The site conditions may be divided into two discernible portions. The first includes Lots 1 through 13; the second includes Lots 14 through 32. The first area is underlain by hard rock at a relatively shallow depth. The second area is underlain by wet, loosely compacted sand exceeding 50 feet in depth in some areas. The sand is underlain by hard chert with a wet clay along the contact zone. Such conditions can be expected to exhibit varying degrees of creep and settlement depending upon the added loadings and the inherent characteristics of site conditions. The degree of investigation necessary to evaluate the area of Lots 14 through 32 far exceeds the scope of this report. The hazards of creep can only be evaluated through extensive laboratory testing and engineering analyses. These conditions are particularly sensitive to seismic loadings which may,

under certain magnitudes and conditions, create large scale failures within wet sands underlain by shales. In any event, extraordinary foundation designs would be necessary to provide any degree of safety against long-term creep or instability under seismic loadings. Therefore, the recommendations presented in this report refer exclusively to the development of Lots 1 through 13 and exclude Lots 14 through 32.

Where fills are proposed, the on-site material may be used for constructing the fills provided it is free of vegetation and it is placed in accordance with the "Recommended General Grading Specifications in Appendix A. The section of the specifications concerning areas to be filled should also apply to cut areas in that such areas should be scarified and recompacted as recommended at the time of construction. The specifications are intended to be used in conjunction with the recommendations presented herein, and should not be separated from this report without expressed written permission from this office. Since no plans for filling were available at the time of the investigation, any future plans for filling should be reviewed and, if necessary, we should submit appropriate recommendations.

Foundations

The recommended foundations for the proposed single family residences are piers and grade beams. The piers should be reinforced cast-in-place concrete with a minimum cross-sectional dimension of one foot. Such piers should penetrate at least three feet into the hard chert. This would result in an average overall depth of 15 feet. Such piers may be designed for an allowable bearing pressure of 5,000 pounds per square foot. This value may be increased by one-third for seismic or other temporary loads. The recommended piers may be "belled" if so desired. In addition, a resistive lateral pressure (passive) for the hard

chert may be designed for by using an equivalent fluid weighing 300 pounds per cubic foot. The portion of the piers exposed to the near surface soils overlaying the rock should be designed for a lateral earth pressure (active) equivalent to a fluid weighing 50 pounds per cubic foot.

The grade beams should be structurally tied to piers in such a manner as to transfer the entire building loads to the piers. The grade beams may be placed in contact with the near surface soils if so desired.

Lateral Earth Pressures - Retaining Walls

Any facilities retaining earth, such as retaining walls, should be designed to accommodate lateral earth pressures. The design of these items may use an equivalent fluid weighing 50 pounds per cubic foot to estimate the active pressure. This value is for a drained condition in the near-surface soils. Drainage should be provided by a layer of crushed rock at least a foot thick between the facility and the retained soil mass. Suitable discharge should be provided by using a perforated pipe and an appropriate discharge location that will minimize erosion.

The foundations for retaining structures placed on the near-surface soil should be placed at least 18 inches below the adjacent grade. These areas should be cleared of all vegetation and ripped and recompacted to at least 90 percent of the maximum dry density as determined by A.S.T.M. Test Method D-1557-70. The recompaction should extend to a depth of at least two feet. The above footings may be designed for an allowable soil bearing pressure of 2,000 pounds per square foot. We recommend a thorough review of all retaining wall designs by this office, prior to construction.

Slabs-on-Grade

Areas to receive slabs-on-grade should be stripped of all vegetation and recompacted to at least 90 percent of the maximum dry density as determined by the A.S.T.M. Test Method D-1557-70. The recompaction should extend to a depth of at least one foot. No sand or crushed rock will be necessary beneath the slabs provided the supporting soil is sand. If this is not the case, a two-inch layer of sand should be placed beneath the slabs. All slabs should be reinforced with wire mesh.

Drainage

The site soils are very susceptible to erosion. Therefore, no water should be allowed to discharge or pond near the foundation line. In addition, provisions should be made to minimize the flow of runoff over the existing slope by constructing berms or lined trenches at the top of all slopes.

Limitations and Uniformity of Conditions.

The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, Jo Crosby & Associates should be notified so that supplemental recommendations can be given. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to call to the attention of the architect and engineers from the project the information contained herein to effect their incorporation into the plans. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice and no warranty is expressed or implied.

DEC 21 1973

RECOMMENDED GENERAL GRADING SPECIFICATIONS

1.1 General Description

1.11 These specifications have been prepared for general grading and site development of this project. Jo Crosby & Associates, hereinafter described as the Soil Engineer, should be consulted at least 4 days prior to any work connected with site development. The Grading Contractor should be made aware of the existence of these specifications.

1.12 This item shall consist of all clearing and grubbing, preparation of land to be filled, filling of the land, spreading, compaction, density testing of the fill, and all subsidiary work necessary to complete the grading of the filled areas to conform with the lines, grades and slopes as shown on the accepted plans.

1.13 In the event that any unusual conditions, not covered by these specifications, are encountered during grading operations, the Soil Engineer shall be immediately notified.

2.1 Clearing, Grubbing and Preparing Areas to be Filled

2.11 All timber, logs, trees, brush, abandoned buildings, debris and other rubbish shall be removed, piled or burned or otherwise disposed of so as to leave the areas that have been disturbed with a neat and finished appearance free from unsightly debris. No burning shall be permitted in the area to be filled.

2.12 All loose soil and vegetable matter shall be removed from the surface upon which the fill is to be placed, and the surface shall then be plowed or scarified to the recommended depth, and until the surface is free from ruts, hummocks or other uneven features which would tend to prevent uniform compaction by the equipment to be used.

2.13 The original ground upon which the fill is to be placed shall be plowed or scarified to the recommended depth.

2.14 After the area to receive the fill has been cleared, plowed or scarified, it shall be disced or bladed until it is uniform and free from large clods, brought to the proper moisture content by adding water or aerating, and compacted to not less than 90% of maximum dry density as determined by ASTM Test Procedure No. D 1557-70.

2.15 Loose soil removed in accordance with paragraph 2.12, if free of vegetable matter and other deleterious material, may be incorporated in compacted fill.

3.1 Materials

3.11 The materials for the engineered fill shall be approved by the Soil Engineer at least 4 days before commencement of grading operations. Any imported material must be approved before being brought to the site. The materials used shall be free of vegetable matter and other deleterious substances. Rocks up to 2 feet in their largest dimension will be permitted in mass fills provided they are not placed within 5 feet of finished grade and that nesting is avoided. Rocks larger than 2 feet will not be permitted unless approved in writing by the Soil Engineer.

3.12 Native soil, free of organic or other deleterious material, may be used as fill.

3.13 The Contractor shall notify the Soil Engineer at least four working days in advance of his intention to import soil from any source outside the project areas, and shall permit the Soil Engineer to sample as necessary for the purpose of making tests to establish the qualities of these materials. The Contractor shall be responsible for all costs incurred in sampling, testing, analyzing, and otherwise determining the applicability of the materials for use on the site. The work shall be performed by the Soil Engineer.

4.1 Placing, Spreading and Compacting Fill Material

4.11 The selected fill material shall be placed in layers which, when compacted, shall not exceed 6 inches in thickness. Each layer shall be spread evenly and shall be thoroughly blade mixed during the spreading to provide uniformity of material in each layer.

4.12 When fill material includes rock, no rocks larger than 2 feet in their largest dimension will be allowed to nest and all voids must be carefully filled with small stones or earth and properly compacted. No such rocks will be permitted closer than 5 feet below the finished grade.

4.13 When the moisture content of the fill material is below that sufficient to obtain the required density, water shall be added. When the moisture content of the fill material is above that sufficient to obtain the required density, the fill material shall be aerated by blading or other satisfactory methods.

4.14 After each layer has been placed, mixed and spread evenly it shall be thoroughly compacted to not less than 90% of maximum dry density as determined by ASTM Test Procedure No. 1557-70.

4.15 Compaction of each layer shall be continuous over its entire area and continued until the required density is obtained.

5.1 Tests

5.11 The standard test used to define maximum densities of all compaction work shall be the ASTM Test Procedure No. D 1557-70. All densities shall be expressed as a percentage of the maximum dry density obtained in the laboratory by the foregoing standard procedure.

5.12 Field density tests shall be made by the Soil Engineer. The number of tests will be determined by the Soil Engineer or applicable specifications.

JO CROSBY & ASSOCIATES 750 CALIFORNIA STREET (415) 960-3208
MOUNTAIN VIEW, CALIFORNIA 94040

File No. 2194 - L5
January 4, 1972

Homestead Savings & Loan Association
c/o Chin and Hensolt
121 Second Street
San Francisco, California

Subject: Stability study for Portions of Block 1928-B
Golden Gate Heights, San Francisco, California

Gentlemen:

We have performed additional field work and analysis on Lots 14 through 32 of Block 1928-B to supplement our previously issued Foundation Investigation report dated August 25, 1971. The additional work included drilling and sampling, specialized laboratory testing, and engineering analyses. The purpose of this supplemental investigation and analysis was to evaluate the static and dynamic stability of the deep sand deposits that were encountered during the initial investigation. The scope of our work also included developing recommendations for the proposed residential structures.

The majority of the samples from the site were obtained from the vicinity of Boring Number 4, as indicated on the enclosed Site Plan. This location was chosen because it was representative of the site soils and because it provided ease of access by the drilling equipment. Rotary wash borings were used to minimize caving in the loose surface sands while obtaining samples from depths of between 9 and 15 feet. Ordinarily the samples were

obtained by hydraulically pushing a 2.875 inch I.D. sampler into the desired soil strata. The samples were then capped with wax to minimize disturbance and loss of moisture until they were to be tested in the laboratory.

The laboratory testing included grain-size analysis, moisture-density determinations, and dynamically loaded triaxial compression tests. Other soil characteristics were obtained from our previous work concerning this property. The dynamic analysis of the samples indicated that the site soils would undergo liquefaction under moderate to severe seismic loads. However, the soils tested continued to exhibit a capacity for accepting additional stress with moderate strain for a finite period after liquefaction had occurred. Therefore, we feel that the site material should react well under all but moderate to severe earthquake conditions.

RECOMMENDATIONS AND CONCLUSIONS

We have discussed two methods of developing the site with representatives of Chin & Hensolt. They have requested that we present recommendations for both alternatives so that the final choice can be made with the benefit of all available data.

The two alternatives are pier and grade beam foundations, and normal foundations placed on a substantial thickness of recompacted site soils. The purpose of either of the alternatives is to minimize the effect of ground movement on the structures. The piers and grade beams accomplish this isolation by founding the structures on deeper and more stable soil strata. The "mat" procedure attempts to spread any ground displacement over a uniform area and thereby minimize differential movements in the supporting soil layer.

Foundation Alternative I, Piers and Grade Beams

The planned one- and two-story residential structures may be founded on piers and grade beams. The piers should extend a minimum of 15 feet below the existing surface, or at least 3 feet into clayey sand or weathered rock, whichever is shallower. We recommend that a representative from our office be present at the time the holes are drilled to evaluate the material encountered and to recommend overall embedment depths for the individual piers. We also recommend that a representative from the structural engineering firm involved be present for similar evaluations from a structural viewpoint. The allowable soil bearing pressure for piers constructed in accordance with our recommendations is 4500 pounds per square foot. This value may be increased 500 pounds per square foot for each additional two feet of penetration into clayey sand or weathered rock to a maximum allowable bearing pressure of 8,000 pounds per square foot. The recommended design bearing value may be increased by one fourth for seismic or other temporary loads. The piers may be belled if so desired. It should be realized that "belling" pier holes in the sandy soil may be difficult and may require some method of support to minimize caving.

In view of the existing sloping topography and the nature of the site material, we recommend that the piers be designed for a downhill lateral pressure equivalent to a fluid weighing 125 pounds per cubic foot. This value is approximately equal to the at-rest pressure exerted by the soil strata. The at rest pressure should be applied to the piers over an area extending from the ground surface to about 10 feet below the ground surface.

A resistive (passive) earth pressure equivalent to a fluid weighing 300 pounds per cubic foot may be applied to the section of the piers extending more than ten feet below the ground surface or into weathered rock. The resulting resistive force should be used to counteract the recommended design pressures as well as all other lateral pressures.

Foundation Alternative II, Recompacted "Mat"

We recommend that at least five lots be prepared at a time using the "mat" procedure to maximize the capabilities of spreading any movements of the site soils. The area to be developed should be stripped of all soil containing vegetation or other contamination and excavated to the desired elevation. The exposed surface should be compacted to at least 90 per cent of the maximum dry density as determined by the A.S.T.M. Test Procedure D-1557-70. Either the site material (provided it is free of contamination and approved by the office) or some suitable import (similarly free of contamination and approved by this office) may be used for the fill material. The fill should be compacted to at least 90 per cent of the maximum dry density as determined by the A.S.T.M. Test Procedure D-1557-70, and should be placed in accordance with the "Recommended General Grading Specifications" in Appendix B. The recommended minimum thickness for the fill is 5 feet and the thickness should not vary more than 2 feet beneath the total building areas.

Provided the fill mat is prepared in accordance with our recommendations, continuous footings may be used for wall loads and spread footings may be used for column loads. All footings should be placed a minimum of 18 inches below the lowest adjacent grade. The footings should have a minimum bottom dimension of 12 inches. Provided the foundations are constructed in accordance with the recommendations, they may be designed for an allowable soil bearing pressure of 1500 pounds per square foot. This value may be increased by one-fourth for seismic or other temporary loads.

Lateral Earth Pressures - Retaining Walls

Any facilities retaining earth, such as retaining walls, should be designed to accommodate lateral earth pressures. The design of these items may use an equivalent fluid weighing 50 pounds

per cubic foot to estimate the active pressure. This value is for a drained condition in the near-surface soils. Drainage should be provided by a layer of crushed rock at least a foot thick between the facility and the retained soil mass. Suitable discharge should be provided by using a perforated pipe and an appropriate discharge location that will minimize erosion.

The foundations for retaining structures placed on the near-surface soil should be placed at least 18 inches below the adjacent grade. These areas should be cleared of all vegetation and ripped and recompacted to at least 90 per cent of the maximum dry density as determined by A.S.T.M. Test Method D-1557-70. The recompaction should extend to a depth of at least two feet. The above footings may be designed for an allowable soil bearing pressure of 1500 pounds per square foot. We recommend a thorough review of all retaining wall designs by this office, prior to construction.

Slabs-on-Grade

The use of pier and grade beam foundations will necessitate the use of structural flooring. Areas to receive slabs-on-grade should be stripped of all vegetation and recompacted to at least 90 per cent of the maximum dry density as determined by the A.S.T.M. Test Method D-1557-70. The recompaction should extend to a depth of at least one foot. No sand or crushed rock will be necessary beneath the slabs provided the supporting soil is sand. If this is not the case, a two-inch layer of sand should be placed beneath the slabs. All slabs should be reinforced with wire mesh. A moisture-proof membrane such as Visqueen is recommended beneath slabs in living areas.

Drainage

The site soils are very susceptible to erosion. Therefore, no water should be allowed to discharge or pond near the

foundation line. In addition, provisions should be made to minimize the flow of runoff over the existing slope by constructing berms or lined trenches at the top of all slopes. The future stability of the existing slopes will depend largely upon proper and efficient drainage facilities. Such facilities should be reviewed and inspected by a representative of this office.

Limitations and Uniformity of Conditions

The recommendations of this report are based upon the assumption that the soil conditions do not deviate from those disclosed in the borings. If any variations or undesirable conditions are encountered during construction, or if the proposed construction will differ from that planned at the present time, Jo Crosby & Associates should be notified so that supplemental recommendations can be given. This report is issued with the understanding that it is the responsibility of the owner, or of his representative, to call to the attention of the architect and engineers from the project the information contained herein to effect their incorporation into the plans. The conclusions and recommendations contained herein are professional opinions derived in accordance with current standards of professional practice and no warranty is expressed or implied.

Very truly yours,

JO CROSBY & ASSOCIATES

Roy E. Moore

Jo K. Crosby
C.E. 13063

REM:ln

JO CROSBY & ASSOCIATES
CIVIL ENGINEERS - GEOLOGISTS

750 CALIFORNIA STREET
MOUNTAIN VIEW, CALIFORNIA 94040

P. O. BOX 4220
TELEPHONE (415) 969-3268

File 2543-16
March 21, 1974

Hawaii-San Francisco Investment Company
107 Jackson Street
Hayward, California

Attention: Mr. William Ghidossi

Gentlemen:

Subject: Soil Conditions and Proposed Earthwork
Blocks 1860B and 1928B
San Francisco, California

Mr. Tony Battaglia from the office of Morgan Howell, A.I.A., has requested us to write this letter to be included in the environmental impact report.

Block 1928B is a steeply sloping site covered with sand. It is proposed to develop it by constructing on the order of 31 single-family dwellings. In general, the structures on the uphill side are to be supported on drilled and cast-in-place piers. Those on the downhill side are to be supported on spread footings founded on sand which has been excavated and recompacted. Our complete soils exploration report and foundation recommendations are contained in our report to Homestead Savings and Loan, File No. 2167, dated August 25, 1971, and in plans and letters exchanged with the office of Morgan Howell early in 1974. It is our opinion that if these recommendations are followed and if competent construction practices are employed, the site is satisfactory for the proposed development.

Block 1860 B is the site of a former rock quarry. Approximately three-fourths of the area is covered with exposed hard chert rock with a moderately sloping bottom and sharply rising ridges at both the north and south ends. The remaining one-fourth of the area is covered with a clean fine sand. It is proposed that the sharply rising ridges of chert be cut down somewhat and that several feet of clean sand fill be placed over the site. It is planned to develop the site by constructing on the

order of 33 single-family dwellings. These structures are to be supported on normal continuous wall footings and spread footings founded on the proposed sand fill. Our complete soils exploration report and foundation recommendations will be presented in our report to Hawaii-San Francisco Investment Company, File No. 2543, now in preparation. It is our opinion that if these recommendations are followed and if competent construction practices are employed, the site is satisfacotry for the proposed development.

Very truly yours,

JO CROSBY & ASSOCIATES

Jim McNely

Jim McNely

JM:sj

XC: Morgan D. Howell, A.I.A.

JO CROSBY & ASSOCIATES
CIVIL ENGINEERS . GEOLOGISTS
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P. O. BOX 4220
TELEPHONE (415) 969-3269

File 2543-40
April 22, 1974

RECEIVED
APR 25 1974

Hawaii and San Francisco Investment Company
107 Jackson Street
Hayward, California

Attention: Mr. William Ghidossi

Gentlemen:

Subject: Pier-Design Criteria
Blocks 1928-A and 1928-B
Golden Gate Heights
San Francisco, California

This letter is in response to our recent discussions with Mr. Ken Smetts, structural engineer, regarding pier design. Pier design is particularly complex at the subject site, and special consideration should be given. This letter is to provide specific design criteria to supplement the general requirements presented in our original report to Homestead Savings & Loan Association, dated January 4, 1972. The design criteria in this letter differ in some instances from those in the original report and should be considered to supersede those in the original report.

In general there are three subsurface strata to be considered in the design of the piers; a relatively loose clean sand underlain by a relatively stable silty or clayey sand underlain by Franciscan chert or greenstone, hereafter referred to simply as rock. All piers should be founded in either the rock or the stable silty/clayey sand. The upper loose sand should be assumed to creep downslope exerting an active soil pressure on the piers.

For vertical loads, as previously submitted in our report, dated January 4, 1972, the piers may be designed using an allowable end-bearing value of 4500 psf. This value may be increased by 250 psf for each additional foot of penetration into rock or into silty/clayey sand up to a maximum

allowable bearing pressure of 8000 psf. The recommended design bearing value may be increased by one-fourth for seismic or other temporary loads.

In addition to vertical loading, the piers should be designed to withstand considerable lateral loading due to (a) wind and seismic forces and due to (b) active soil pressure exerted by the downslope creep of the upper loose sand. It is suggested that the piers be designed by analyzing the lateral forces of (a) and of (b) separately, since the upper stratum of relatively loose sand may be assumed to resist wind and seismic loads but not the active soil pressure due to its own downslope creep.

For lateral loads, the piers may be designed using an active earth pressure of 50 psf/ft for the downslope creep of the loose sand, a resistive passive earth pressure of 350 psf/ft up to a maximum of 5000 psf for the underlying stable sand, and a resistive pressure in the rock of 500 psf/ft up to a maximum of 5000 psf. These pressures as well as the recommended hinge points about which to compute moments are shown diagramatically in the attached Figures 1 and 2.

The depths of the three critical subsurface strata range widely across the site. In order to provide criteria for pier design, an idealized tabulation of subsurface conditions is submitted in attached Table I as the best estimate that can be made at this time. It should be expected that the actual drilled depths may be found to vary from these idealized conditions. A schedule of a range of designs for steel reinforcement cages should be compiled in order that the reinforcing steel might be quickly revised in the field if required for certain pier holes as drilling and pouring operations proceed.

In addition to the specific design criteria above, the following general conditions should be considered:

1. It would be advisable to take out as much of the lateral load as feasible in the top row of piers. These will be the easiest to drill and to case, and the rock will be closest to the surface.

2. The lower four rows of piers should be designed as small in diameter as feasible, since a small diameter hole will be easier to drill on a slope, will be less liable to caving, and, when poured, will pick up less active earth pressure from the sand creeping downslope.

3. The sand will be prone to caving, so pier holes should be poured as soon as practicable after drilling.

4. Pier holes will probably require casing.

5. We understand that it is proposed to excavate a considerable portion of the loose sand prior to drilling piers. Whatever depth of sand is excavated may be subtracted from the figures submitted in Table I.

Very truly yours,

JO CROSBY & ASSOCIATES

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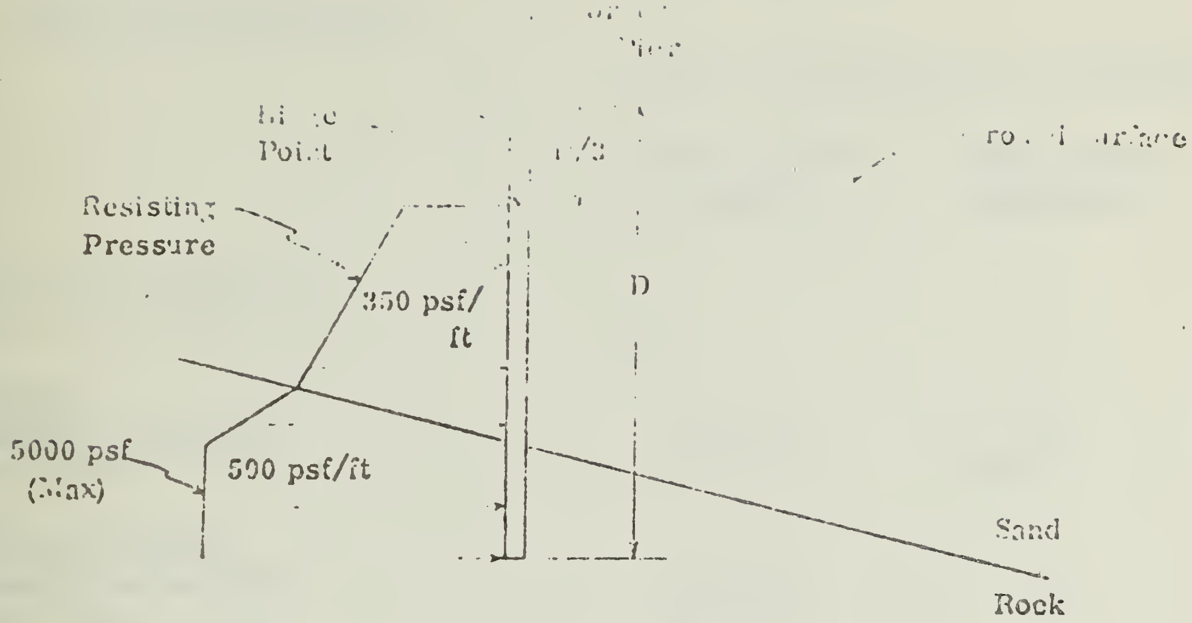

FIGURE 1 -- Wind and Seismic Lateral Loading

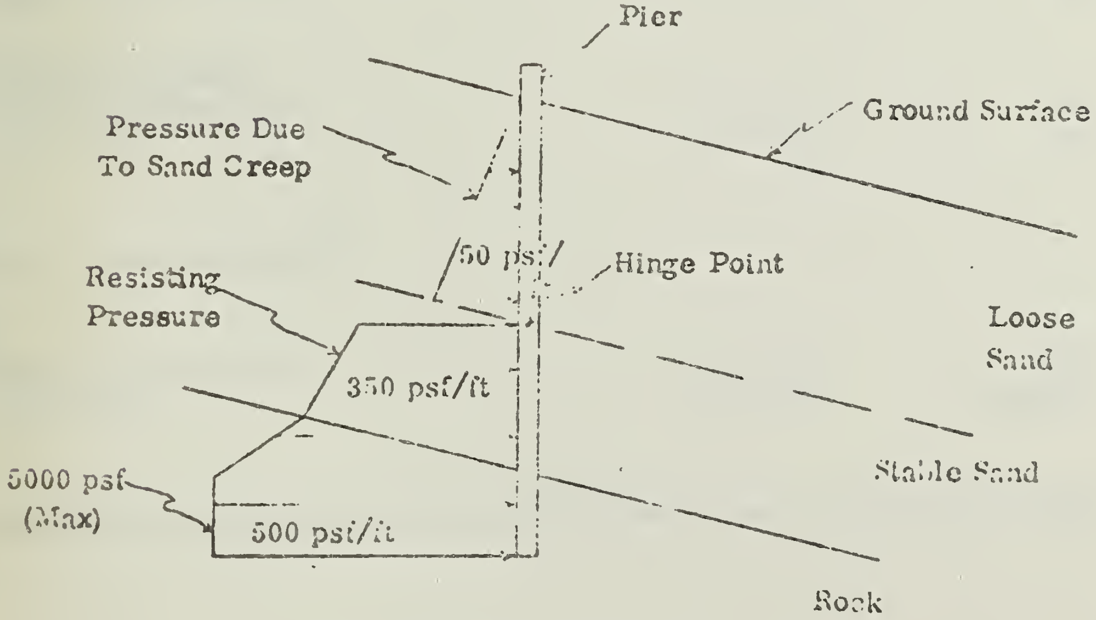

FIGURE 2 -- Lateral Loading Due To Downward Creep of Loose Sand

ABLE I -- SUBSURFACE CONDITIONS

	Depth Below Existing Ground Surface (Ft)	
	Most Probable Range	Best Estimate For Design
lock 1928-A, Lots 4 through 13; lock 1928-B, Lots 1 through 3:		
op Row of Piers		
Bottom of Loose Sand	8 - 12	10
Top of Rock	10 - 40	Over 30
ower Four Rows of Piers		
Bottom of Loose Sand	10 - 12	10
Top of Rock	30 - 50	40
lock 1928-B, Lots 4 through 9:		
op Row of Piers		
Bottom of Loose Sand	8 - 12	10
Top of Rock	10 - 15	12
ottom Four Rows of Piers		
Bottom of Loose Sand	10 - 16	15
Top of Rock	17 - 40	30
lock 1928-B, Lots 10 through 16:		
ll Piers		
Bottom of Loose Sand	12 - 20	20
Top of Rock	20 - 60	Over 40

TE: Assume stable silty/clayey sand between bottom of loose sand and top of rock.